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## COMMISSION CHAIRMAN PRESENTS ANGLES OF TELEPHONE REGULATION

Lawyers do most of the public speaking in our country, so it is not surprising that the annual convention of the American Bar Association, which was recently held in Chicago, listened to some notable addresses. One of the most important of these discussed the public relations of service companies, and was delivered by John W. McCardle, chairman of the Indiana Public Service Commission.

It contained many references to the telephone industry—not all of which were favorable—and pointed out how the companies furnishing telephone service can better their standing with their customers.

As head of the Indiana commission Mr. McCardle is in close touch with the utilities. Generally speaking, he is disposed to be fair with them, and his public record includes instances of granting companies rates that his more timid colleagues considered too high.

* * * *

This courage of Chairman McCardle is also shown in his address before the bar association by his stout declaration that the famous investigation of public utilities by the Federal Trade Commission, with all its newspaper uproar, amounted to "exactly nothing." He is opposed to any federal government agency interfering with state regulation of the utilities and said so without any mincing of words.

In his Chicago speech Chairman McCardle criticized the newspapers for attacking service companies and blamed them for disturbing the relations between them and their patrons. Such a position on the part of a state commissioner is rather unusual, as the rate-makers are more likely to be on the other side in the hope of getting favorable press notices.

* * * *

Mr. McCardle's first reference to telephone companies followed his statement that all utilities should be commended for seeking to build up good will.

"The telephone companies," he then said, "whose patrons number approximately 25,000,000, reach more homes than either the gas or electricity utility companies. Unfortunately, telephone service is most apt to engender dissatisfaction, even though it be kept to the highest possible plane of efficiency.

"As a matter of fact, many operators of telephone companies have failed to keep pace with the times, and have rendered service which cannot be considered even fairly satisfactory. Sooner or later the telephone company which neglects the interests of its patrons is bound to reap a harvest of discontent, the manifestations of which are increased costs of operation because of a lack of cooperation on the part of patrons, and a decreased revenue."

It is fair to presume that this reference chiefly concerns Indiana companies, with which Chairman McCardle has had close contact, but his general remarks may be applied to the industry as a whole.

In the speaker's opinion, one of the factors which has created bad feeling is the insistence of some utility operators on too large a return on the value of their property. He argued that this was unwise even though the company's contention might be upheld by the courts, as the effect on the public is unfavorable.

Mr. McCardle said it is poor business for utilities to ask for 7 or 8 per cent on their capital when other lines of industry—the farmers especially—are barely meeting expenses and some find themselves on the red side of the ledger. At that, he presented figures to refute the claims of radical newspapers that the service companies have raised their rates unfairly in comparison with other prices.

In fact, Chairman McCardle shows that in the last 15 years the cost of telephone, gas and electric service has advanced much less than other commodities. Here is how he does it:

"There is a general impression throughout the land that utility charges have, during recent years, been increased beyond all reason and thus a tremendous burden has been imposed upon the general public. It may be interesting to compare the 'burden of increased rates' in Indiana with the increase in prices of other commodities, I have made a complete analysis of the rate schedules on file with our commission from the year 1914 to the year 1930, from 16 of the largest cities.

The increase in artificial gas, for consumers who use 5,000 cubic feet per month, in the period of time from 1914 to 1930, has been 36 per cent. For consumers who use 50,000 cubic feet per month, the in-

crease has been 17 per cent. This makes an average increase of 26 per cent.

The rate on electricity per month to the small or domestic consumer during this period of time has decreased 16 per cent. The large consumer during this period of time has, on the same basis, had an increase of 0.6 per cent.

The increase in telephone rates from 1914 to 1930 has been: On single line residence telephones, per month, 39 per cent. On single line business telephones, per month, 61 per cent.

Comparing these increases with commodities of all kinds, also labor, we find from the government index, taking 100 as a basis, that commodities have increased 41.3 per cent from 1914 to 1930.

Labor on the same basis, considering the wage scale of Indianapolis, has increased 126.7 per cent.

This makes an average increase for labor and commodities from 1914 to 1930 of approximately 83 per cent. The average increase on gas is 26 per cent, and on telephone rates for the same period, 50 per cent, or an average increase on gas and telephone of 38 per cent.

Comparing this with the average increase of commodities and labor of 83 per cent, we find an increase of commodities and labor over utility rates in Indiana of over 100 per cent."

Analyzing these cost figures, which he says he obtained from Washington, Chairman McCardle says that "Whatever the published results of the investigation by the Federal Trades Commission, it is obvious that utility rates are 45 per cent lower than the average increases in the cost of labor and all other commodities."

## COMING CONVENTIONS

**New Hampshire Telephone Association, Hotel Ashworth, Hampton Beach, September 11 and 12.**

**Telephone Association of Maine, Hotel Eastland, Portland, September 16 and 17.**

**United States Independent Telephone Association, Hotel Stevens, Chicago, Ill., October 14, 15, 16 and 17.**

**Independent Pioneer Telephone Association of United States, Stevens Hotel, Chicago, Thursday, October 16.**

**Illinois Telephone Association, Pere Marquette Hotel, Peoria, November 12 and 13.**

**Missouri Telephone Association, Hotel President, Kansas City, November 18 and 19.**

**Canadian Independent Telephone Association, Prince George Hotel, Toronto, November 25 and 26.**

**Iowa Independent Telephone Association, Hotel Fort Des Moines, Des Moines, April 7, 8 and 9, 1931.**

**Telephone Mergers.**

No address on the utility situation would be complete without a reference to the era of consolidations, and in discussing telephone mergers Chairman McCardle has some suggestions of interest to telephone men. He said:

"The merging of telephone companies throughout the state has not improved public relations, largely for the reason that it has eliminated the free service which was formerly in effect between most of the small towns. The protest from the patrons has been of a very determined nature. In one section of the state, over 900 telephones were removed and are still out. The inhabitants of the small towns have many reasons for wanting to retain their free service.

In the small town, the business interests are vital to the life and welfare of the town, and any expense by way of toll charges diverts trade to the larger town or city. Another thing to consider is the system of improved highways radiating in every direction over the entire country.

The substitution of tolls for free service, when transportation facilities are so improved, works a hardship on the small town. I am inclined to think, and do recommend, a county unit for telephone service—and it is possible for the companies to institute and maintain such service without prohibitive cost."

* * * *

Another point stressed by Chairman McCardle was that telephone engineers—in fact, all utility engineers—in making appraisals of property should do less theorizing and endeavor to cooperate more with the appraisers on the other side of the table. In most rate cases this advice might be offered the other party to the controversy as well. Both should be reasonable.

# The "Buried" Underground Cable Plant

## Analysis and Conclusion Relative to the So-Called "Buried" Cable Method of Installing Underground Plant—Description of Methods Followed in This Type of Construction—Second Award, Plant Division "Telephony's" Prize Contest

By B. C. Burden,

*Foreign Wire Relations Engineer, Lincoln Telephone & Telegraph Co., Lincoln, Neb.*

The term "buried cable" refers to telephone cables placed in the earth in such a manner that they cannot be removed except by digging them out. The practice of burying cables has been followed for the past 20 years by Independent companies with varying degrees of success.

This article represents an analysis of, and conclusion based on, a large amount of data collected on buried cable from many sources. The individual opinion and experiences of those furnishing data have been carefully weighed and averaged in an effort to get a true picture of the buried cable problem.

In the following discussion of the relative good and poor points of buried cable, the best type of buried cable construction is implied.

The advantages of buried cable, in the order of their relative importance, are:

1. Reduces maintenance costs and depreciation on the cable plant.
2. Presents a much neater and less conspicuous outside plant.
3. Reduces fire and life hazards from electric lines and, to a certain extent, the "public hazard" as a result of fewer poles and messengers over road crossings, etc.
4. Eliminates to a large extent the cost and difficulty of obtaining proper tree clearance.
5. Facilitates the placing of plant on private property, by virtue of the willingness of property owners to accept this type of construction.

The principal disadvantages are:

1. Possibility of service interruption on a large number of lines, due to mechanical damage from workmen digging or driving stakes into the ground.
2. Less flexibility than an aerial cable plant; in the event of "excessive fill," relief measures are more costly, and if an existing cable must be replaced no salvage is feasible.
3. More skill is required to quickly locate trouble on buried than on aerial cable.

4. The physical condition of the buried cable cannot be determined as is possible on aerial cable.

The magnitude, if any, of the reduction in maintenance costs and in physical deterioration of buried as compared to aerial cable will depend entirely upon the method used in burying the cable and steps taken to prevent or reduce damage through digging operations of foreign workmen.

In a well constructed "buried cable" plant, experience indicates that the maintenance costs may be expected to be from 2 to 3 per cent less (on an annual charge basis) than for aerial cable. Depreciation has been found also to be 2 to 3 per cent lower than aerial cable.

From the standpoint of appearance, buried plant has much in its favor, especially when plant must necessarily be located on a street. In the better class residential sections pole lines usually constitute an eyesore to the property owners, and the employment of buried cable tends toward better public relations.

The increasing tendency of power companies to use voltages in excess of 5,000 volts for primary distribution in the smaller towns makes buried cable plant particularly attractive as the hazard from crosses is considerably reduced.

Likewise the removal of messenger and open-wire crossings eliminates the danger of plant getting down and catching on a passing vehicle with a resulting heavy damage suit.

The necessity for obtaining proper tree clearance, which is generally both a costly and difficult procedure, is practically eliminated by buried cable. These are one of the principal items which tend to make aerial cable charges somewhat higher than buried.

In high-class residential sections where no alleys exist, the property owners usually permit telephone and power companies to build pole lines along their rear property lines under protest and only because they know that unless they do they cannot be furnished with telephone and power service. A bad feeling is often created between the public and the telephone company for this reason. The property owners, on the other hand will generally give their ready consent to a buried or underground cable plant which has an occasional terminal pole.

**Mr. Burden Gives the Latest Practices and Opinions Regarding the So-called "Buried Cable" of Underground Plant.**

Discussing the bad features of "buried cable," we find that probably the most important is the likelihood of workmen digging for water, sewer, or gas mains, cutting into buried cable and thus putting a large number of lines out of service. This disadvantage can be partially compensated for by locating the buried cable where it would be least likely interfered with.

Another and very effective method is to get the city board to pass ordinances prohibiting digging of any kind without a permit. When the permit is issued the location of the proposed digging is checked with a plat showing the alleys and streets containing buried cable. If the digging is near the buried cable, the workman obtaining the permit is given a print showing its location.

Aerial cable plant is more flexible than buried cable; that is, it permits reinforcement or replacement with other cables with greater economy than does buried plant. In the typical small town this is not much of a disadvantage, for the growth is usually so small that buried cable can economically be placed with a sufficient number of pairs to provide for the ultimate number of lines required over the life of the cable.

Moisture trouble in buried cable cannot be located by the "old Spanish custom" of going out and looking for sheath breaks, as is possible with aerial cable. However, by means of a Wheatstone bridge or the "inductive tone method," faults can be quickly and accurately located in buried cable with about the same facility as on aerial cable.

In fact, it is generally conceded that moisture faults in buried cable give more positive indications when using the "inductive tone method" than they do on aerial cable. This is undoubtedly due to the greater tendency of faults to dry out in aerial cable, thus not giving the "carry out" that exists on buried cable faults.

The fourth disadvantage of buried cable —that its general physical condition cannot be determined from inspection—is not an important one if construction methods are followed which insure that sheath corrosion will not take place. Any method which does not guard against this effect should not be used.

Buried cable has been the subject of much contention and investigation for a number of years, and the telephone companies over the country may be classified into three groups with regard to their opinions on buried vs. aerial cable.

These groups are:

1. Those companies which have used buried cable for a number of years and have adopted it as standard.

2. Those companies which have tried buried cable and, because of a large amount of trouble from sheath corrosion, have gone back to aerial construction.

3. Those companies which do not yet feel that buried cable has sufficient merit to warrant its general adoption for

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**Some 15 or 20 years ago, the smaller telephone companies commenced the installation of lead-covered cable underground without protection of any kind. In the years that have followed, a great deal has been learned concerning the so-called "buried" system of placing cable underground. In his article on "Buried Cable," Mr. Burden presents the results of an extensive investigation of the methods used and the experience with them.**

**After graduation from the high school in Red Cloud, Neb., where he was born, Mr. Burden spent a year in the Bliss Electrical School in Washington, D. C., graduating from it in 1921. His high school course, however, had been interrupted during the war when he spent one year as switchboard installer on government work for the Western Electric Co.**

**After two years in electrical work, in 1923 he became manager of the Wilcox Telephone Co. at Wilcox, Neb. Later in the same year he went to Red Cloud, Neb., as manager of the Farmers Independent Telephone Co., then operating in competition with the Lincoln company. In 1925, Mr. Burden was successful in bringing about the consolidation of the competing exchanges, the last in the state. After another two years spent in consolidating and rehabilitating the plants, he became assistant to the plant engineer of the Lincoln company in 1927. He was promoted to his present position in 1929 and is now active in foreign wire work and plant extensions.**

**His work with the Lincoln company is of a wide and varied nature, including outside plant design, inductive interference cases, and special studies. Plant men will be particularly interested in this article on a subject that has been given a great deal of consideration by smaller companies in the past 15 years.**

exchange cable plant. This group includes the largest operating companies.

An analysis of a number of reports on buried cable indicate that companies which have taken definite steps to prevent sheath corrosion are generally well satisfied with buried cable and favor it in preference to aerial.

The author's conclusions, based on an analysis of a large number of reports and data covering actual experience with buried cable in all parts of the country, are:

1. If definite steps are taken to insure against sheath corrosion, buried cable plant will prove very satisfactory.

2. Buried cable will in general offer more advantages to the small single-unit operating company than to large multi-exchange companies. This is due to the higher grade of skill and equipment required to produce a good aerial cable plant as compared to buried cable plant.

3. Buried cable may be advantageously employed by the small operating companies instead of aerial cable under the following conditions:

(a) In slow-growth towns where cable can be provided initially which will be adequate for 15 years or more.

(b) In long cable runs where terminals are far apart and the pole line is not needed for toll.

(c) Where no alleys exist and poles must be set on private property.

(d) Where tree conditions are bad.

(e) Where civic pride demands the removal of wires and cable.

(f) In locations where irregular alley or street feeds make guying difficult and expensive, buried cable should be considered.

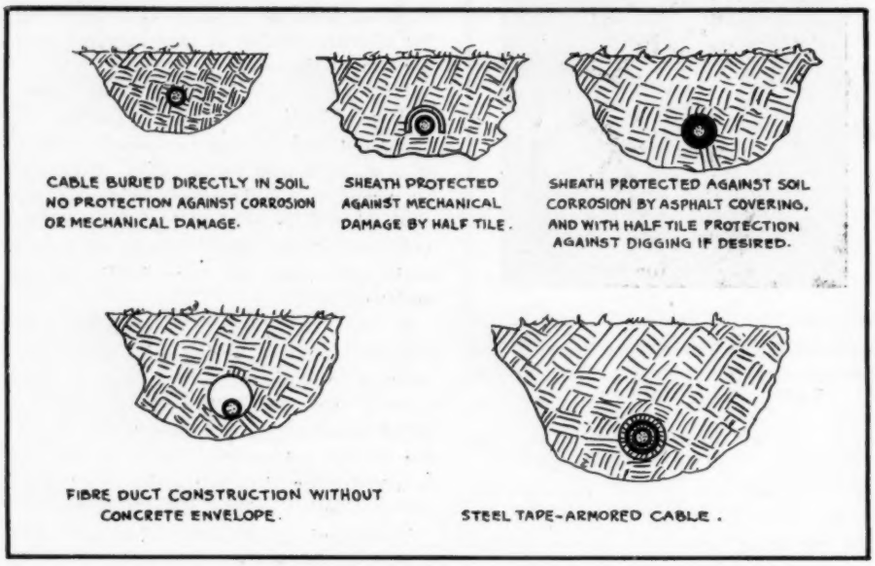
(g) In general, the possibilities of buried cable should be considered whenever a considerable amount of existing aerial cable or open wire is to be replaced for lack of capacity or physical reasons.

In the placing of cable underground there are six fundamental types of construction which might be used. These are:

**Types of Buried Cable Construction.**

1. Permanent conduit construction, i. e., multiple-tile duct, iron pipe, wood duct, fibre encased in concrete. This is not a buried cable method.

2. Fibre duct construction without concrete envelope and without manholes.


CABLE BURIED DIRECTLY IN SOIL NO PROTECTION AGAINST CORROSION OR MECHANICAL DAMAGE.
SHEATH PROTECTED AGAINST MECHANICAL DAMAGE BY HALF TILE.
SHEATH PROTECTED AGAINST SOIL CORROSION BY ASPHALT COVERING, AND WITH HALF TILE PROTECTION AGAINST DIGGING IF DESIRED.
FIBRE DUCT CONSTRUCTION WITHOUT CONCRETE ENVELOPE.
STEEL TAPE-ARMORED CABLE.

Five Types of Buried Cable Construction.

3. Cable buried directly in the earth without either a protective asphalt coating around the sheath, or some form of protection over the cable to prevent damage through digging.

4. Cable encased in a protective coating of asphalt and buried in the earth but without any protection against mechanical damage.

5. Cable encased in asphalt and protected by means of a creosoted board, half tile, etc., against mechanical damage.

6. Steel tape-armored cable buried directly in soil.

Permanent conduit construction is in general too expensive to be considered by small companies except where several large cables must be carried along a route. This type of construction is referred to as underground cable construction as distinguished from buried construction.

**Fibre Duct Construction.**

Fibre duct construction without a concrete envelope offers a fairly cheap method of placing single cables underground. It has been found that the fibre duct will protect the cable against soil corrosion and will provide a somewhat more flexible arrangement than where cable is placed directly in the earth.

Experience seems to indicate that the fibre conduit will flatten out after a few years of service and prevent further use as a duct, although it will still serve to protect the sheath against corrosion.

It is usually feasible to salvage cable in this type of construction, which is quite a factor in the case of the larger size cable.

This type of underground construction, while not, strictly speaking, a "buried cable method," nevertheless because of its characteristics is generally placed in the buried cable category.

In well drained soils and where no traffic passes over the buried cable the fibre conduit would probably retain its shape indefinitely, thus permitting its continued use as a duct for both pulling cable in and out.

**Cable Buried Directly in Earth.**

Attempts to bury lead cable directly in the earth without any protective covering have in general proved unsatisfactory. Where the sheath is in direct contact with the earth an effect known as "sheath corrosion" may take place whereby the sheath becomes pitted and in time holes develop in the sheath and permit the entrance of moisture.

The occurrence and magnitude of this effect depend upon natural soil conditions and to a certain extent upon surface conditions above the cable.

Experiments at Purdue University brought out that sheath corrosion increases with the amount of organic matter in the soil. In soils containing limestone, cinders and other calcareous substances this was particularly bad. The reports of many companies indicate that sheath corrosion is particularly severe where cable is buried under manure piles, near toilets, or in alleys in which drug stores drain ice cream tubs, etc.

It has been determined also that cable composed of lead tin alloy is most resistant to sheath corrosion, pure lead next and lead antimony closely following.

Because of the dangers from sheath corrosion, buried cable without any sheath protection (method 3) should not be considered.

The "tar paper compound method" is one of the most successful of the various practices of burying cable. This method consists of encasing the cable in a ¼-inch to ½-inch layer of asphaltic compound held in place initially by tar paper. The asphalt very effectively prevents sheath corrosion, due to the action of the soil, from taking place.

The necessity for protecting the cable against mechanical damage will depend upon the location and whether or not ordinances requiring digging permits exist or can be passed.

There are two principal means of protecting the cable: by laying the cable under half-tile, or by laying a creosoted plank over the top of the cable.

The practice of burying large toll cables, which are protected against sheath corrosion or mechanical damage by steel tape armor and layers of jute, is in use by the Bell system companies and is very successful. Tape-armored cables are not generally available in the small sizes, hence

this method will not be feasible for exchange cable plants until such time as tape-armored cables in the small sizes are developed.

**Buried Cable Construction.**

In a buried cable plant it is usually advisable to place the large size cables, leaving the office in 3-inch iron conduct or 4-inch sewer tile duct, out to the first branch splice.

This is not necessary for sizes of less than 200-pair and could be eliminated with cables up to 400-pair if mechanical protection as well as sheath protection is provided. In general, however, the placing of all cables of 200-pair or larger in 4-inch sewer tile duct can be economically justified for two reasons: the danger of a large number of telephones being thrown in trouble through digging operations is minimized, and the cable, which has relatively high salvage value, can be removed at the end of its useful life.

No manholes are placed at the junction of conduit and buried cable construction, but the duct ends are thoroughly sealed to prevent entrance of water.

**Buried Cable Trench.**

Where a cable feed is located on the street, the ideal location for the trench is in the parkway midway between curb and sidewalk. This location minimizes the danger of pole-using companies damaging the cable when placing poles at the curb line. If the power companies are not liable to set poles on a street and where paving exists, a trench so dug that the cable could be placed a few inches back under the curb should be very successful.

When the cable must cross under pavement, a conduit of proper size should be pushed under the street by means of a pole jack or regular pipe-pushing apparatus.

If cable is being placed across a street which will later be paved, and there is a possibility of requiring an additional cable along this route, a fibre duct should be laid alongside of the buried cable for future use.

Whenever it is necessary to place cable under pavement other than at street crossing, it should be placed in permanent conduit construction and with one or two vacant ducts for future use.

Tar Paper and Compound Method of Burying Cable.

The best location for the trench in alleys is just inside the property line (covered by owner easements). This avoids mechanical hazards from electric companies digging pole holes or sewer and water construction projects which usually trench down the middle of the alley. If permission to place on private property cannot be obtained, then the best location is just inside or outside the wheel ruts made by traffic through the alley.

**Location of Terminal Poles.**

Terminal poles should be located one or two to the block as required and preferably on alley and dividing property lines. Unprotected terminals should be used except where severe power hazards exist or where open wires or drops extend more than two blocks from the terminal.

The height of the riser poles should be 25 feet where drops cross alleys and 25 feet to 30 feet on streets. When the cable is placed on rear lot lines where no alley exists, the poles can be from 16 feet to 20 feet high. Twenty feet clearance should be provided over streets and 18 feet over alleys. Ten feet is sufficient where only pedestrian traffic is involved.

The terminal leg should be protected six feet up the pole, and to the point at which it leaves the main cable with iron conduit as shown in the illustration. The cable terminals should be made up in the shop with the proper length leg to reach down to the buried cable.

**Trenching.**

The depth of the trench should range from 24 inches to 36 inches, depending on the surface conditions. In improved parkways and rear lot lines the trench can be at a minimum depth. Where surface conditions are irregular, or if considerable traffic passes over the cable, a maximum depth is preferable.

The width should be as narrow as possible. which generally means tile spade width—four inches to five inches. On a large amount of trenching a "baby trencher" could probably be employed to dig a trench more economically than by hand.

**Soil Conditions and Cable.**

In using the "tar paper compound method," the only care that need be exercised with regard to soil is to avoid soils containing cinders or locations where seepage from manure piles, chemicals, toilets, etc., might damage the sheath should it not be completely covered with compound.

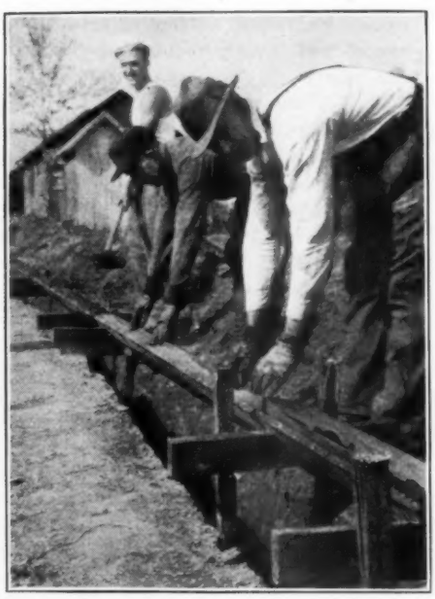
The methods of avoiding these conditions would be to dig a deeper trench or to lay tile duct through the affected region. However, if the compound is carefully and sufficiently applied, it can be relied upon to prevent sheath corrosion even in unfavorable soil.

Lead antimony cable sheath is satisfactory.

There are two methods by which cable may be compounded before placing in the trench. The first makes use of sections of wooden trough, usually 10 feet in length, made up of 3-inch and 4-inch pine boards nailed together.

Five to ten sections of trough are usually provided and placed end to end on trestles, and a strip of tar paper six inches wide rolled out along the bottom of the trough.

The cable is pulled out along the trench and through any intervening conduit on



Cable Pulled Out Preparatory to Compounding, Before "Burying" It—Compounding Cable by the Trough Method.

cross streets, after which 1½ inches to 2 inches of heated compound is poured on the paper in the trough along its length. After the compound has cooled slightly the cable is laid in and additional compound poured over it. Next a man follows up, folding the paper around the cable so as to distribute the compound evenly over the cable. A layer of from ¼ inch to ¾ inch is desirable.

By the time this operation is completed on the 100-foot section the compound will have cooled sufficiently to permit removing the trough and trestles at the starting end and laying the cable in the trench. The trench is then filled in and hand-tamped.

It is pointed out by some companies which have had considerable experience with buried cable, that it is very important that the sheath be thoroughly cleaned with gasoline to remove grease left on from cable manufacturing operations, otherwise the compound will not adhere well.

The other method of applying compound differs from the first in that the paper is rolled out along the top of the excavated dirt instead of providing troughs for this purpose. The disadvantage of this method is that as uniform a distribution of the compound could not be obtained as with troughs.

A few inches of slack is provided at terminal poles to permit cutting-in the leg, and no compound is placed for several feet each way. The splice can usually be made on top of the trench although some companies dig a hole at each splice to permit splicing in the trench. After the splice is completed, the main cable, splice, and cable leg to the riser pole are all compounded.

In the fibre conduit method the cable is pulled into the conduit and a short length of conduit is omitted at each splice to permit splicing. It is necessary to dig a hole for each splice and to compound all exposed cable as explained.

### Special Methods.

Various plans have been devised whereby complete underground service can be given.

Most of these systems utilize either regular conduit or buried cable, as has been explained, with the exception that "control pedestals" or underground terminals in manholes are utilized to distribute from, rather than terminal poles. Distribution to the houses is made by means of one, two and ten-pair lead-covered cables extending from the underground terminal or control box to the residence and, where feasible, from one basement to the next.

An analysis of a large number of cases of trouble on buried cable indicates that the following types are most common. They are listed in the order of greatest frequency of occurrence.

1. Mechanical troubles, due to digging for water, gas, and sewer mains. Driving down stakes for road markers, etc. In towns where "digging permits" are required, little trouble was experienced.

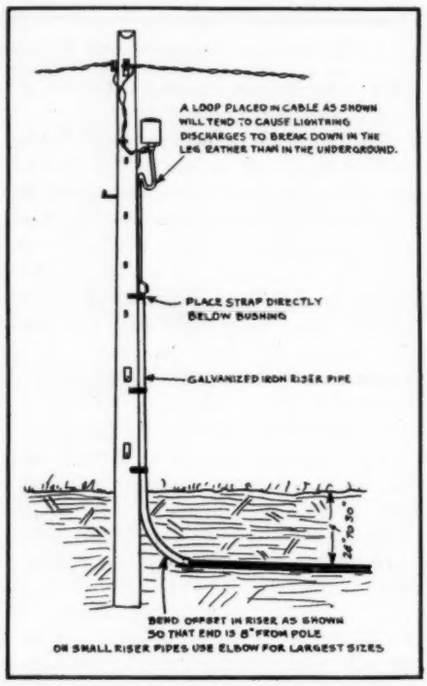
2. Sheath corrosion due to cinders above or surrounding cable buried without compound protection.

3. Sheath corrosion along manure piles or toilets, or due to excessive organic matter.

4. Lightning punctures due to long open-wire or drop feeds without protection.

5. Miscellaneous troubles, such as rats and gophers eating the sheath, etc.

If the cable is placed in fibre conduit or adequately compounded, little trouble should be experienced except mechanical as in the first class given above. As previously mentioned, a "digging permit ordinance" will greatly reduce troubles from this source.


A LOOP PLACED IN CABLE AS SHOWN WILL TEND TO CAUSE LIGHTNING DISCHARGES TO BREAK DOWN IN THE LEG RATHER THAN IN THE UNDERGROUND.
PLACE STRAP DIRECTLY BELOW BUSHING
GALVANIZED IRON RISER PIPE
24 TO 30"
BEND OFFSET IN RISER AS SHOWN SO THAT END IS 8" FROM POLE
ON SMALL RISER PIPES USE ELBOW FOR LARGEST SIZES

**Details of Bringing Cable Up Riser Pole.**

### Buried Cable Costs.

No attempt has been made to set up average cost units for buried construction as insufficient data were available to do this. However, the following cost experiences of various companies may be helpful in drawing conclusions as to relative costs of buried and aerial cable.

One company placed 11,000 feet of cable in trenches and the total cost of compounding, tar paper, back-filling, splicing and placing risers was 11 cents per foot. It found that 100 pounds of compound is required for compounding 300 feet of 50-pair No. 22 gauge cable with an average coating of ⅜ths inch.

Another company's experience in placing 4,000 feet of 50-pair cable was 18 cents per foot exclusive of cable. This was placed, however, under rather adverse digging and weather conditions.

A rather comprehensive cost study set up by one company covering a rather large area and comparing cost of aerial vs. buried plant indicated the initial costs of buried and aerial plants to be about the same. A reduction in poles required of approximately 60 per cent was possible with the buried plan. On an annual charge basis, aerial cable showed 17.5 per cent and buried cable 13.6 per cent.

From the meagre cost data available it would appear that annual charges of 12 per cent for buried and 18 per cent for aerial cable would be fairly reasonable and that the average cost of placing 25-pair and 50-pair No. 24-gauge cables by the "compound" method should not exceed 25 cents per foot and may be as low as 15 cents per foot.

The writer's conclusion, after a thorough analysis of all available data that could be collected, is that "buried cable" is practical, economical and in some respects (from a single-unit company standpoint) preferable to aerial cable.

Buried cable should be used with caution in towns having substantial growth characteristics, although for permanent block distribution cables it could be used to advantage.

The selection of size and multipling arrangements for buried cables should be thorough and based on accurate forecasts of present and future circuit requirements rather than guesswork. In general, the tendency should be to provide an ample margin of vacant pairs for the economical life of the cable rather than the narrow margin that is sometimes possible in aerial cable plant design.

## Annual "Sell-A-Phone" Campaign of Salina, Kans., Company.

"Records are made to be broken" is the slogan and campaign cry of the telephone division of the Western Power, Light & Telephone Co., Salina, Kans., as I. F. Krehbiel and his staff recently announced the annual Sell-A-Phone campaign. This intensive drive is scheduled for the ten days from September 15 to 25. It will find every employe from district manager on down spending his or her spare moments in making calls and talking telephone service.

Employes will be urged to stress the use of extension service in their calls upon patrons and prospective patrons. Residence extensions, it is stated, cost less than two cents a day and save hundreds of steps each day. During the campaign, installation charges on new telephones and extensions will be waived. This same plan was used last year and made a fine talking point.

## Convention of Canadian Association to Be Held in November.

The Canadian Independent Telephone Association announces that it will hold its annual convention at the Prince George Hotel, Toronto, on November 25 and 26.

# A Florida Rate and Route Card Method

## Description of Card and Filing System Developed in Effort to Speed Up the Furnishing of Rates and Routes to Most Frequently-Called Places—Special Loose-Leaf Prong and Ring Binders Used According to Size of Exchange

By H. E. Nott,

*Traffic Superintendent, Peninsular Telephone Co., Tampa, Fla.*

TELEPHONY is one of the papers that is always most welcome at my desk, and for several reasons. It is one of my first and oldest friends and advisors in the telephone world.

Having been connected with almost every branch of the work during nearly 25 years —to be exact since March, 1906, I have subscribed either directly or through the company since that time, and have followed it carefully in the work of special interest to me at the time as well as trying to learn something about the job as done in other departments. Every employe should have some working knowledge of the other departments and of the trend, aims and ideals of the entire telephone business.

Another feature of TELEPHONY that is of much personal interest to me are the pictures and personal notes of the almost hundreds of people, scores of whom I have met or known in the ten years of my time spent "on the road" in installation, engineering and sales. These bring back very pleasant memories and are next best to seeing them again.

At present I am most interested in traffic work and read very carefully all the articles published. All of these, in turn, are blue-penciled and turned over to those in direct charge of operating and supervising.

We have been especially interested in the recent article by Mrs. Dorothy H. Van Ert, chief operator of the Michigan Home Telephone Co., Muskegon, Mich. We believe there is much in that which can be taken advantage of in our own company. It seems that at times several are working along the same lines and often bring out the same idea. It may be that "necessity is the mother of invention" as the saying goes. I refer this time to the rate and route card of the Michigan company. We have been using a somewhat similar device which I will try to describe.

In September of 1929 we started a study of some way to speed up the furnishing of rates and routes to the most frequently-called places. In addition to the standard books for this purpose, we had compiled a small loose-leaf book, listing about 600 places and their rates, but having no routing information. We carried on our operators' keyshelf bulletin another list of about 200 routes and station-to-station rates.

The very frequent changes in this information, however, made it impossible for us to keep a neat list, and the cost of frequent reprinting, even in the larger exchanges, was prohibitive. Typed lists were too limited in capacity. We first thought of card drawers and of various files at the rate clerk's desk, and of several other plans whereby each point could have an individual record which could be referred to very quickly or changed without affecting the other listings, or added to in alphabetical order when need of new listings should occur.

We decided against the small rotary file now being introduced in some systems on account of having to provide different rate information for each different rate point handled by the toll center. The rotary just referred to is no doubt ideal for offices having one set of rates only.

Tampa is toll center for about 40 rate points or tributaries; some of our other toll centers being responsible for from three to ten. That does not mean in our case that we have to handle everything for all of these places, for some we handle calls to Bell points only, allowing the tributary to do its own work within a restricted territory. Naturally some of our nearby points take the same rates to more distant points as the toll center, but a different rate than the toll center to places close in.

The route in all cases, however, would be the same, being handled from the same switchboard. That gave us the thought of making a separate sheet for each point desired, listing all of our points liable to have a different rate on the same sheet, having columns for the various classes of rates; that heading also showing the hours in which the rate is effective. This saves reference to a rate conversion chart as is necessary when the day station-to-station rate only is given.

PENINSULAR TELEPHONE CO. CLASS Q67V BLOCK

| BLOCK | RATE FROM | | STA. - STA. 4:30 A.M. TO 7:00 P.M. FIRST 3 MIN. | STA. - STA. 4:30 A.M. TO 7:00 P.M. EACH ADD'L MIN. | PER - PER. APPT. & MSGR. FIRST 3 MIN. | PER - PER. APPT. & MSGR. EACH ADD'L MIN. | REPORT CHARGE | EVENING 7:00 P.M. TO 8:30 P.M. FIRST 3 MIN. | EVENING 7:00 P.M. TO 8:30 P.M. EACH ADD'L MIN. | NIGHT 8:30 P.M. TO 4:30 A.M. FIRST 3 MIN. | NIGHT 8:30 P.M. TO 4:30 A.M. EACH ADD'L MIN. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS 73 Q | TAMPA | W | 3.75 | 1.25 | 4.75 | 1.50-1.25 | .55 | 3.00 | 1.00 | 2.00 | .65 | |
| TT 74 W | Arcadia | W | 3.75 | 1.25 | 4.75 | 1.50-1.25 | .55 | 3.00 | 1.00 | 2.00 | .65 | |
| RR 73 R | Blanton | | | | | | | | | | | |
| VV 74 A | Boca Grande | | | | | | | | | | | |
| UU 73 T | Chadwick Beach | | | | | | | | | | | |
| SS 73 K | Citrus Park | | | | | | | | | | | |
| SS 73 D | Crystal Springs | | | | | | | | | | | |
| RR 73 S | Dade City | W | 3.50 | 1.00 | 4.50 | 1.50-1.00 | .55 | 2.80 | .90 | 1.90 | .60 | |
| SS 73 N | Dover | | | | | | | | | | | |
| SS 73 B | Ehren | | | | | | | | | | | |
| RR 73 U | Fivay Junction | | | | | | | | | | | |
| UU 74 H | Fort Ogden | | | | | | | | | | | |
| RR 73 Q | Garden Grove | | | | | | | | | | | |
| RR 73 X | Greer | | | | | | | | | | | |
| SS 72 J | Keystone Park | | | | | | | | | | | |
| TT 74 R | Limestone | | | | | | | | | | | |
| RR 73 N | Lacoochee | | | | | | | | | | | |

NOTE: MX. = MULTISWITCH; TRANS. = TRANSCONTINENTAL; D. = DIRECTORY WORK REQUIRED

| TO | NOTE | T. C. | FIRST | ALT. | 2ND ALT. |
|---|---|---|---|---|---|
| Ann Arbor, Mich | MX | Ann Arbor | via Cleveland O atla ® | | |

**Typical Rate and Route Sheet Used by Peninsular Telephone Co.**

At the bottom of the sheet we have a line for the name of the place wanted and the route. Codes in a note space of this line indicate *MX*, directory work required before taking up toll line, etc., or refer to a special note line just above for other miscellaneous information such as certain subscribers on another exchange, transcontinental, etc.

We list the toll center name first at the top of the sheet, as it is most used, then follow with the rest in alphabetical order. Our arrangement is such that we can use both sides of the sheet where we have a large number of rate points; we had to do that in Tampa.

Just in front of each exchange or toll station name we show the block number, and in the left margin we show the block number and class rating of the place wanted. Our reason for this is to save time in looking up rates in case of a call from one of our tributaries to some point to which we felt we were not liable to have enough calls to justify filling in the information at first set up.

We have not attempted to fill in this data for all of our stations, some of which might never place a call to that distant point. If we do get a call, we write it in. Thus the longer this system is in use, the more valuable it becomes.

Having decided on the general plan, we cast about for a suitable way of filing and handling this information. A prong binder seemed to offer the best solution for our exchanges of larger size, and a special ring binder for our smaller exchanges.

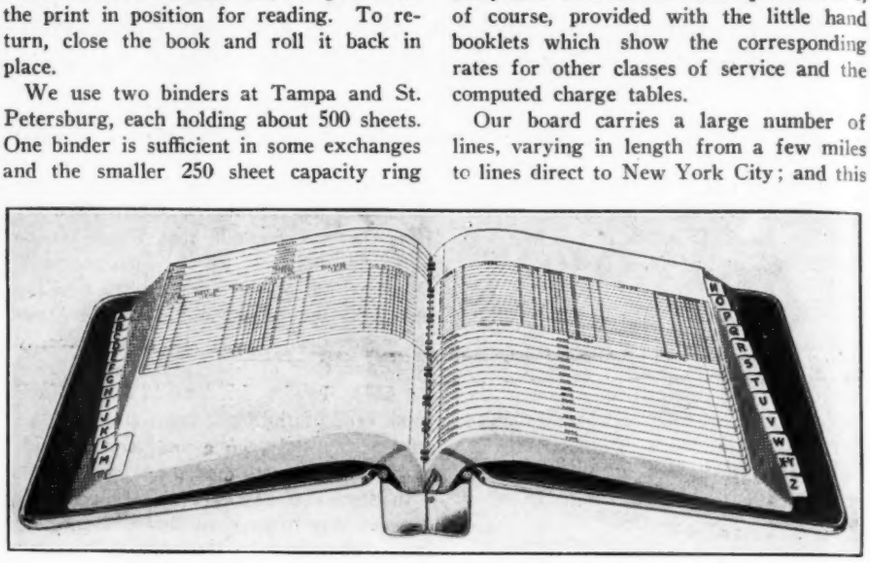
The separate pages are laid in the binder in "banks" of about 20; we allow some spare space for slipping in new listings without transferring pages. The lower line of each sheet—name of point wanted and the routing information—is exposed below the sheet that is over it. This exposes the name of all points wanted in alphabetical order, regardless of the name of the state, together with the route data.

Alphabetical indexing is provided and special insert sheets with red tabs are laid between the banks making up each letter to more easily throw a complete set of 20 or more sheets. To obtain the rate for any of our places to the point named on the bottom of the sheet, throw back the page covering it, and all information—time of day applicable, etc.—is visible.

This prong binder is a metal-bound, leather-covered one, having a patented opening device that allows it to be opened half-way for posting, or in full for additions or changes. The action is instantaneous and very convenient. We believed at first that the girls might experience some difficulty on account of its weight—10 pounds complete—but we hit on the happy plan of filing all of our rate and route books in a rack file with the back of the book toward the clerk and its top edge downward.

In this way the clerk reaches the top of the book, which is its bottom as to printing, and tips it toward her, allowing it to bear its own weight on a small rubber mat. When the book is laid flat, it opens with the print in position for reading. To return, close the book and roll it back in place.

We use two binders at Tampa and St. Petersburg, each holding about 500 sheets. One binder is sufficient in some exchanges and the smaller 250 sheet capacity ring



Type of Binder in Which Rate and Route Sheets Are Filed.

binder serves 100 per cent of the need in our tributaries that are restricted in building their own calls. These lists have all been carefully selected from experience and review of accounting department records, and they care for 95 per cent to 100 per cent of the places we call.

During the night hours we move the rack with the standard and binder books to a small table convenient to the operators working at the board. In the case of certain built-up calls relayed by or tributary to a toll center where both the route and other than the day station rate are wanted, we have found as many as seven references in three or four rate, list of station, first reference books, etc., necessary. Here we obtain the same information with one reference.

This has not dispensed with the need of a rate clerk, but it allows her to do much other work, and it does speed up the work of the line operators enough that the time saved may equal one or more operators, in addition to the customer satisfaction at the greater speed of serving him and the saving on circuit time on any tributary line that may be held for that call.

We have proceeded very carefully with this installation, placing it in one exchange at a time and proving its value; but if anyone now has any doubt about it, let him try to take it away from our exchanges and see what happens.

We have taken advantage of another help on rate and route work on direct lines that may be a new idea in some exchanges. This plan was suggested for use in the Southern Bell system last year, but for certain reasons was not put into general use. This is the use of an auxiliary designation strip for all toll lines—in other words, using a double designation.

The secondary carries alternate route and station-to-station rate information, indicating also *W*, where reference is to the white rate sheets, and *Y*, where reference is to the yellow rate sheets. The operators are, of course, provided with the little hand booklets which show the corresponding rates for other classes of service and the computed charge tables.

Our board carries a large number of lines, varying in length from a few miles to lines direct to New York City; and this information, tied directly to the jack, has been a wonderful help to the operators. A study of calls filed at the time these strips were installed showed that 84 per cent of our calls were to the direct circuit point. Using these two methods, we have done away with the keyshelf bulletin for this class of work. We now use it for other information as needed from time to time and according to the work done at that position.

Where there is a large multiple in the board or several kinds and uses of trunk circuits, it is often difficult, especially for a new operator or for one working part of her time at an even numbered position and part time to an odd numbered position, to find these readily or to remember their exact use. To overcome this we use the very old method of installing colored designation strips—each color having its meaning to the operator. Many have no doubt wished for such but have thought it hard to get the colored strips. Read how easily this can be done:

We print or type the standard paper strips, then use a ten-cent store water color, blot it and allow it to dry for about ten minutes. A little practice and experimenting will enable one to bring out several strong colors as red, orange, yellow, green, etc., that are quite permanent and still show the print practically as well as on white. The strips may be colored in whole, or more than one color used on a strip for some special information about a line or a group of trunks.

Yellow on the secondary strip means to us "Directory work required before taking up the toll line." Red indicates office trunks over which the operator should not ring. Orange and green are each for certain type of trunks. Pink—made by using more water and less of the red color—

indicates that a ticket is required. It is the color used on all recording trunks and on certain toll lines on which we ticket everything.

Other color schemes are used including coloring one-half the width of strip only. Some of these tell the operator the class rating of the office as tributary, relaying office, etc., and have served to straighten out all doubt when making connections to or for them and in clearing-out, etc.

This plan also has the advantage that the chief operator and supervisor can tell at a distance almost exactly the set-up of the cords, or to what group a lamp signal may belong that may appear on the board or hang too long.

All calls in our system except transcontinental or transatlantic are handled C. L. R., this being one of the original places used in the development of that method.

We are also quite proud of our toll dialing system, which our engineers brought out several years ago. We not only build up our own calls to the subscriber on the direct circuit point but we also use the dial to build through one exchange to reach the subscriber or the operator at the next without the aid of a switching operator.

This saves an immense amount of work at the inward and through positions and shortens the use of the toll circuit both in reaching the station and in clearing out. The removal of the plug clears the entire circuit. We also receive direct switchhook supervision from the distant subscriber at the board placing the call.

In all, we believe it is the little things that go to make the total big. We believe in reading TELEPHONY, and taking advantage of the other fellow's experience where it will serve us better than our own; in saving our pennies to make the dollars; and in saving the seconds and doing the little things that make the customer know that he is getting the very best of service.

## Getting Subscribers to Call by Telephone Number.

By MRS. ROY COLLAR,
*Farmers Mutual Telephone Co., Montour, Iowa.*

When we took over the management and operation of the Farmers Mutual Telephone Exchange in the town where we have been for six years, the use of numbers was practically unknown, all patrons calling by name. Our being entire strangers made the work slow and tedious.

Our first move was to make our own card, giving each telephone a number, with the simple ringing code in use in a nearby city exchange operated by the Bell.

It was three years before we felt sure enough of our people to ask the board of trustees for permission to put out directories. They consented, with the understanding that no outside advertising be accepted. We started, with the help of our printer, selling our home merchants, trades people and professional men the idea of "Home-Town" advertising, and were successful in getting enough advertising to pay for the printing job.

We mailed each subscriber a directory; and it is a question which interested them more—the advertisements or their own names and numbers.

We have from the beginning of our work here adhered to the practice of answering all calls with "Number, please?" instead of the "Hello" to which they had been accustomed. I might add that this had been received with varying degrees of approval—some resented it, some were interested, while a majority ignored it. But after the new books were sent out, the response was so fine, as to exceed our fondest hopes.

From the youngest to the eldest, nearly every one has shown a real desire to call by number. One dear old lady said: "Well, I can't see very well to look up the numbers, but if it will make it any easier for you I'll do it." Although there are a few who still "can't see any sense in it when Central knows everybody's ring," the majority of our people are proud of the improvement and glad to be out of the "sticks."

## The Traffic Department's Responsibility for the Service.

By DELIA MCKELVEY,
*Evening Chief Operator, Northern Texas Telephone Co., Sherman, Texas.*

The telephone company is composed of three departments—the plant, the traffic and the commercial—neither of which could exist without the other. But to the public, the traffic department is the direct representative.

The first requirement of the traffic department is carefully-selected and well-trained operators. It is natural for members of an organization to follow the leader, so the chief operator must be very careful to set a good example for her operating force. She must make her supervisor feel that she is willing to cooperate with her in every way. She must be on the alert for weak points in the service and seek to strengthen them, and must keep familiar with the changes in operating methods.

When there are irregularities in the work, the chief operator should inform her supervisor so that she will be in a position to handle the situation. The chief operator should make the operators feel free to ask for advice on any feature of the work they do not understand.

The supervisor should be given full authority, held personally responsible for her division of operators.

Operators should bear in mind that they represent the company, and that their company's reputation is materially affected by their work and conduct. They should be ready at all times to render prompt and cheerful service to all subscribers, never allowing personal feelings of any nature to interfere with their work.

Operators should consider P. B. X. operators as subscribers and treat them with just as much courtesy.

Operators should be courteous to one another and should recognize their supervisor as a superior, who is a friend and a teacher, who will offer them constructive criticism. They should respect the supervisor's knowledge of operating rules and practices and should follow her instructions closely. They should be willing to cooperate with their supervisor in every way, and also with the other operators.

The operator who is willing to take advice and not resent it will increase her value with the company.

On many common battery switchboards, operators can "listen-in" on conversations, but they should only do so when necessary; and they should never divulge any information regarding the conversations they may hear. Any operator who is guilty of this offense should be promptly discharged.

The "Voice with a Smile" will always win a favorable place in the heart of the public, while an irritable, abrupt one is likely to give an impression of undue haste or indifference and may create a harmful impression of the force, or may cause dissatisfaction in the service. So courtesy is more essential in telephoning than in personal dealings, as the tone of the voice means more than the words spoken.

Accuracy is next, for without it speed means nothing because one slow answer or one wrong number will offset a favorable impression of prompt service. Therefore, speed is a desirable asset.

The operating room should be kept as well ventilated as possible. It should also be kept quiet.

Standard methods of operating should be used. Teamwork should be encouraged. All faulty equipment should be promptly reported, and all complaints diplomatically handled.

The telephone company must work as a team, each department helping the other "to pull the load"; but on the traffic department rests the responsibility of rendering a quality of service which will assure the stability and growth of their company.

## Five Iowa District Meetings Announced for This Month.

The Iowa Independent Telephone Association has scheduled five district meetings for this month. The first will be held at Guthrie Center on September 15, which will be followed by another conference at Clarinda on September 16.

Denison has been selected for the meeting to be held on September 17, and on September 18 a meeting will be held at Sioux Center.

The last of this group of Iowa district meetings has been scheduled for Friday, September 19, at Emmetsburg.

# Here and There in Telephone Work

### Philadelphia Golf Course to Have Telephone Every Third Hole.

Unusual preparations are being made by officials of the Merion Cricket Club, Philadelphia, Pa., for the national amateur golf championship to be held there late this month, in which Bobby Jones will strive to win the fourth jewel for his championship crown.

In addition to a new sprinkling system, a new telephone system connecting with the clubhouse also is being installed on the course. There will be a telephone at every third hole except the 12th, which is close to the clubhouse, and the 18th.

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### Cornell Has Largest College Campus Telephone System.

Cornell University, Ithaca, N. Y., is now said to have the largest telephone system in service on any college campus in the country.

Construction of a new dormitory group of buildings brought the question of telephone service to the fore. According to survey report of the New York Telephone Co. prior to the new dormitories, the service consisted of 48 stations for the use of 1,045 students living on the campus, an average of 22 students per telephone. With semi-public stations located in the corridors, no one person was responsible for answering calls, a condition causing delay, considerable disturbance and annoyance, particularly on calls coming in late at night.

The recently-installed facilities consist of 714 telephones located in eight dormitories. Each isolated room is provided with an instrument, while suites consisting of a study and two or three bedrooms have one installation in the study.

In those dormitories where the arrangement is such that two rooms are connected by a short hallway, a single telephone is provided in this hallway to serve both rooms.

The university's new 1,560-line P. B. X. switchboard is located in Sage College and handles calls 24 hours a day, operators in attendance being in the employ of the university but trained by the New York Telephone Co. With an ultimate capacity of 240 trunks, the switchboard is now equipped for 60 trunks, 47 of which are in use.

Nearly 8,200 feet of underground cable, 6,653 feet of interior cable and 40,000 feet of wire were required to connect the system.

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### Telephone Company Shares in Publicity of Model Home.

The sales department of the Pacific Telephone & Telegraph Co. in connection with a "model home" in Oakland, Calif., carried out a novel and valuable activity.

In accordance with the policy of the Pacific company a model telephone arrangement was installed as an aid to the thousands of people visiting a display of this nature in determining what is comprehended in a model telephone installation; one that would, from a cost standpoint, be within the limits of the average family and yet provide the utmost in convenience from this important part of a home's furnishings.

Talking Over Portable Telephone Connected to Jack Living Room of Model Home.

In order that the public might get a better idea of the convenience of this telephone installation, the telephone company decided to take pictures of live models using the telephones. The job was done with company personnel. First, an outline of the best descriptive pictures using the telephones was decided upon. Then the personnel was chosen to fit these pictures. This was done by photographing a large number of company employes and choosing from these photographs those who photographed best.

Arrangements were then made by the telephone company with the department store sponsoring the model home, to loan the necessary costumes, which included formal dress clothes, sport clothes, business clothes, and afternoon and evening frocks.

One photograph shows the father sitting

Photographs Taken of Telephone Installations in Model Home and Posed for by Employes of Pacific Telephone & Telegraph Co.

in a large easy chair in the living room answering a telephone call, the telephone having been brought into the room and connected up by the butler. Another presents a corner in the library, showing the arrangement of the telephone on the desk. The grandfather using the telephone in calling for a physician is shown in another photograph, the wife sitting beside the bed holding the baby which is ill. This photograph was designed to show the convenience and time-saving feature of telephoning for medical aid from the bedroom in case of sickness.

Still another photograph shows the arrival of a guest who has just been conducted to her room. It also shows the maid connecting the telephone to a jack. This telephone is intended to be at the disposal of the guest while visiting this family. Another photograph shows the daughter of the family and some friends sitting in the living room. They have just decided to take in a show and one of the men is telephoning for theater seats.

Many other photographs were taken showing the various uses of the telephone from every room of the house. These interesting photographs were used in displays in the business offices of the telephone company, in the business office of the newspaper which also sponsored the model home, and in the department store. One of the results of these displays was the attracting of many persons to the model home who would not have visited it otherwise.

In order that the telephone company might provide and build a convenient installation at the minimum of cost, it was necessary to begin with the plans of the home. Therefore, the telephone men began their work with the architect and arranged with him to include in his plans and specifications the necessary conduits, etc., for a complete telephone installation.

## Rural Police Patrol Telephones Along Main Highways.

By C. B. Kugelman,

*Plant Superintendent, The Portsmouth Telephone Co., Portsmouth, Ohio.*

During the last few years night parkers, highway robbers and others of the lawless element have made it necessary for county sheriffs to adopt some means to better protect the law-abiding citizens who may desire to use the highways at night.

In conjunction with our company, Sheriff M. J. Caldwell worked out a scheme of rural police patrol boxes. The county officials furnished substantial wood boxes equipped with locks, in which we mounted local battery magneto wall substation sets. Each telephone is equipped with a double pole, double throw switch in order that instant connection with Central and the sheriff's office may be obtained over one of two lines.

As rural telephone lines in the Portsmouth territory extend from 10 to 27 miles on all main roads, 12 boxes were thought ample to care for the territory, although others may be added later.

Rural Police Patrol Box on Main Highway Near Portsmouth, Ohio.

The boxes were mounted on the line poles about five feet above the ground. The connecting wires run through 10 feet of conduit rigidly mounted to the box and pole to eliminate cutting of wires. From the end of the conduit the wires were run through bridle rings to the connecting lines. The illustrations show a box, both open and closed, on the pole.

The roads are patrolled by two crews of two deputies each, every night. These crews cover about 150 miles of road, reporting at regular intervals to the sheriff's office. As each automobile and man is practically a traveling arsenal, it is not healthy for the lawbreaker who resists arrest.

According to reports, night crimes along the highways of Scioto County have been practically eliminated.

## Telephone Operator Builds Business as "Courtesy Doctor."

"Be courteous; it won't cost anything," was a favorite office slogan when Joan Wing, of Grand Rapids, Mich., landed her first job at a telephone switchboard at the age of 15. But Joan didn't believe in the "something for nothing angle," and began to ponder plans for teaching organized courtesy to business organization, amid the prevailing confusion of wrong numbers and the "Yeah, whaddya want."

After six years' practical study of the switchboard and office routine, she inaugurated the career of "courtesy doctor," and set out to sell big business on the low cost of 100 per cent courtesy and its incalculable value. Her imposing list of corporation clients and an army of cheery, pleasant-voiced telephone operators all over the country who say "Blank and Blank, good morning," testify to the popularity of her courtesy doctrine.

"Courtesy Is the Unseen Customer" and "Speed with Politeness" are her slogans for switchboard efficiency. She sees to it that the voices of the operators are sweet and clear.

"Under my telephone methods," she says, "speed and courtesy are of equal importance. 'Good morning,' 'Thank you,' 'Sorry to have kept you waiting,' are not time-wasters. They build good will.

"Suppose a customer your vice-president has entertained over a period of several months in an effort to cultivate good will, finally calls up to place his account. 'Yeah! Whaddya want?' asks the switchboard operator in a raucous voice. 'Not in. Naw, I don't know when he'll be back!' and bang goes the receiver.

That's one way to make a satisfied customer so dissatisfied that he takes his business elsewhere."

Miss Wing requires all employes under her guidance to immediately identify themselves when they answer the telephone. "Hello" is banned on all occasions as a needless time-waster. "Who is it wants him?" heads the blacklist as a needless insult and a destroyer of good will.

In the beginning, Miss Wing confined her unique service to telephone conversation. But later she was requested to instruct the other employes in the art of meeting clients with grace and courtesy. Now her courtesy regime extends through every department of the great corporations that contract for her services.

Interior of Rural Police Patrol Box Showing Telephone.

# Bill Collections and Public Relations

## Personal Calls Effective in Making Collections—Diplomatic Adjustment of Subscribers' Accounts Retains Their Patronage—Accurate Toll Billing Essential—Addresses Given at the Convention of Oklahoma Utilities Association

### The Adjustment of Telephone Subscribers' Accounts.

By Miss Edith Birdsall,
*Cashier, Western Telephone Corp., Garber, Okla.*

We, as telephone people, find that one of our chief objects is to please the public. We also strive to handle the public in such a manner that they will have confidence in us.

A great many times we find that our subscribers do not understand rates and charges, and it becomes our duty to explain to them our rates and how charges are made. Many of the so-called errors are caused by a lack of information on the part of the subscriber.

A short time ago, a subscriber came into our office, claiming that we had made a mistake in his account and stating that he wanted it corrected. He said that the rate in the directory was much less than what he had been charged. We immediately asked him how the call was placed, and he stated that he just called the party's telephone. The only thing left for us to do was to look up the particular ticket. On finding the ticket, we learned that the call was placed person-to-person and that the parties had talked overtime.

Frequently, after having explained to them how the charges are made, the complainants will pay the accounts. Of course, you are going to find some subscribers who will not be convinced as to how the charges are made; and in this event it has always been our policy to do the best we can and settle the difference; not to let it run from month to month, for the longer an account runs, the more difficult it is to get it settled.

We also have the subscriber who thinks that he should have a refund every time his telephone is out of order. Upon investigating a number of the cases we find that the telephones have not been reported, and upon inquiring when it was reported, we learn that he reported it to some one but does not know who or when.

In cases like this we are obliged to use our better judgment. When we actually believe that the party has been without service for a sufficient time to grant an adjustment, we think that the adjustment should be made.

We have another class of subscribers, and I am sure that every company represented here has some of the same class. It is the chronic kickers. We know that every time they come to the office to pay on account, there is going to be something wrong with it. About the only thing that we can do in these cases is to sit tight.

We feel that in making adjustment that it is impossible to have a set rule to go by, for what will work in one case will not work in another.

In summing up the situation, we feel that there are two things to keep in mind: First, to satisfy the patron if possible; second, to maintain the good will of the people we serve.

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### Toll Billing and Public Relations.

By Miss Harriet Dodson,
*Standard Telephone & Telegraph Co., Skiatook, Okla.*

What makes toll billing possible? First, a person desiring to talk to someone in another town. Then the little toll ticket and an operator's head and a pencil.

Now we can have no word for the thousands of these that are completed with supreme accuracy. But we are going to let the little ticket represent one that is not entirely correct. Did you every try to think of all the possible circumstances that could arise from one incorrect ticket?

Here is your ticket; the party is on the line; Mr. Smith talking from A 55. You pass the ticket. What will register in the other operator's mind? Probably eight-55. Therefore, the ticket is billed on Mr. Jones' statement. Mr. Jones gets his bill.

He happens to be one of the many subscribers with an uncontrollable temper. What follows? "This is not my call. Don't even know anybody at that place." Blesses the operators and the telephone management in general. Imagine the rest of the story. What tact the chief operator must use, etc.

What would have prevented this? Plain distinct articulation. Take time to say *A*, as in apple, once in a while. Most incorrect numbers occur on rural tickets. That makes it all the worse. Many rural subscribers have no idea of the routine of office work, and the possibility of mistakes. They think only of their few calls and not of the thousands that are correct.

Now think in the same light, of mistakes in timing and rating. These have even a deeper psychological effect. The subscriber cannot deny the call and just thinks you are trying to beat him out of a few cents. So he comes into the office with that "you are not going to put anything over on me" attitude. Oh, there is a world of such pessimists who place long distance calls.

Then there is that subscriber who wouldn't for the world be so little as to tell *you* about what he thought was a 20-cent error and thus give you a chance to explain or correct; but he will tell everyone else he happens to meet.

You can readily foresee similar discords from incorrect names. The party says Blackey. You know somebody by the name of Mackey; you pass it as Mackey—she hears it as Lackey. Her *a* looks like an *o* to the toll billing clerk. You almost have white for black.

This makes me think of a work order we received not long ago. The name of the place where the telephone was installed was so poorly written that it was a case of using our imagination. It looked like Ha—? Pa or Po—? and St—b? Well, the middle name looked like it might be Paper, so the clerk made out the plate as "Hackers Paper Stand." The bill came back, and the chief operator at the place called discovered that the "Hokus Pokus Store" did not receive a bill.

And that leads me to the greatest grief in the life of a toll billing clerk—writing and figures than cannot be quickly read. That covers every phase of the ticket, from the date on down.

That date is a little thing but it certainly can be annoying. It is true that is most always stamped; but so often it is stamped over the "in" or "out" on the ticket and, therefore, difficult to read correctly, much less in a hurry. Then so often the ink is too pale; you will save a lot of grief if you will re-ink those pads or get new ones once in a while.

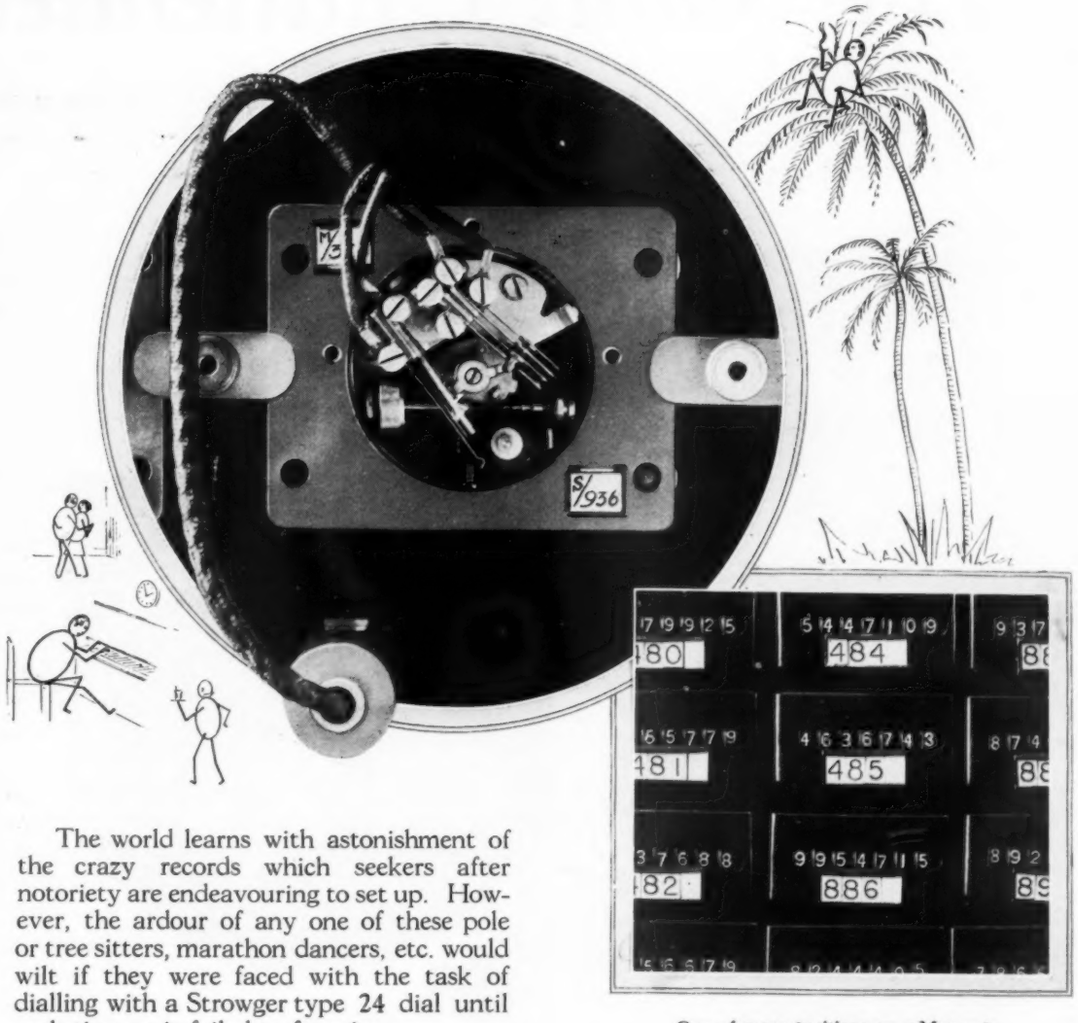
Now for the rest of the ticket in terms of writing. It isn't the so-called perfect writing we are concerned about. It is plain and distinct writing—in other words readable letters and figures—that we want; not that which we can look at the second time and comprehend. We want figures and writing that the eye can fall upon at a distance of about a foot and a half, and at the rate of from 500 to 900 tickets an hour, and at the same time not have to break the rhythm of the stroke or of the mind by the second or third glance.

Did I say 900 tickets? Yes. The report came out in last month's Southwestern Telephone News of a girl in the Kansas City office who in billing 20,000 tickets, averaged that and with no errors. We must learn to cultivate a methodical mind so we can combine the method, the speed and the accuracy.

Let us try to avoid discords in telephone work, the same as the musician tries to avoid the wrong note. Is it not equally important? In other words, don't stop with the head and hand, make it a threefold work. Put your heart into it also. Is it not a challenge to help avoid discords of life? You may not intend for

(*Continued on page* 30.)

# A CHALLENGE TO RECORD MAKERS




The world learns with astonishment of the crazy records which seekers after notoriety are endeavouring to set up. However, the ardour of any one of these pole or tree sitters, marathon dancers, etc. would wilt if they were faced with the task of dialling with a Strowger type 24 dial until such time as it failed to function.

Dialling with all the eccentricity displayed by human beings in practice, machines in the Strowger Laboratories have never yet accomplished this feat. Re-lubricated on three occasions only the Strowger type 24 dial was operated no fewer than ten million times, and, although signs of wear were apparent in the fibre buffers and impulse spring contacts, the Dial was still functioning perfectly at the end of this drastic life test; a test twenty times in excess of the requirements of the Australian Commonwealth telephone administration.

*One of many positions on a Magnetic Clutch type Dial Testing Machine, with Meters designed to register seven figure numbers.*

**AUTOMATIC TELEPHONE MANUFACTURING CO., Ltd.**
**Strowger Works,**
**Liverpool, England**
**ASSOCIATED COMPANY: International Automatic Telephone Co., Ltd., London**

# The Small Unattended E
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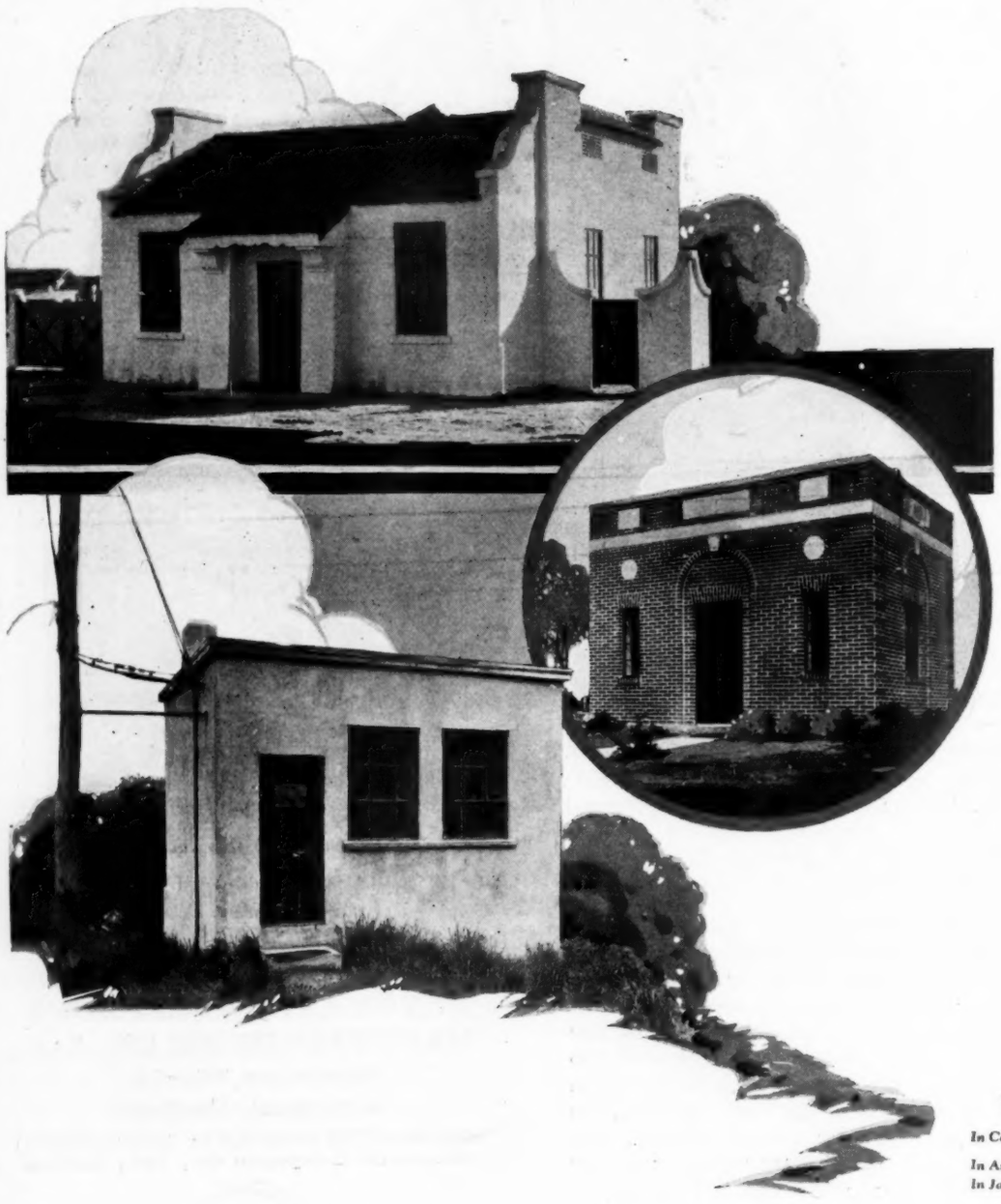

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STROWGER
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GENERAL EXPORT
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In Canada . . . Independe
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STROWGE
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When writing to Automatic Electric Inc., please mention TELEPHONY.

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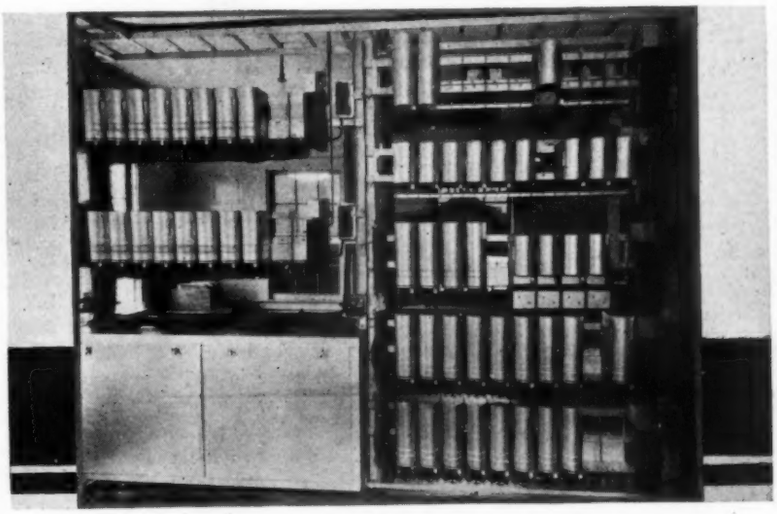

xchange is a Strowger develop-
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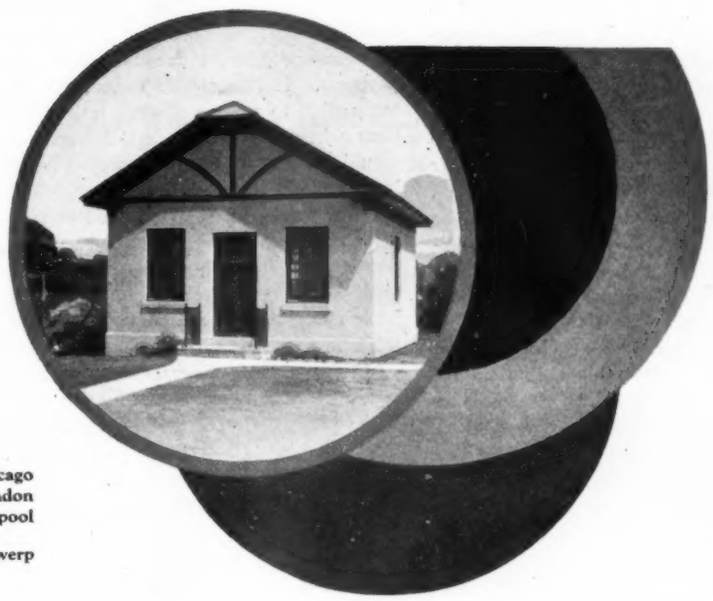


**ic Electric Inc.**

*Manufacturers of*
TELEPHONE AND SIGNALING SYSTEMS
33 West Van Buren Street, Chicago, U. S. A.
*Offices in All Principal Cities*

ASSOCIATED COMPANIES

American Electric Company, Inc. . . . Chicago
International Automatic Telephone Co., Ltd., London
Automatic Telephone Manufacturing Co., Ltd., Liverpool
The New Antwerp Telephone and Electrical Works . . . . . Antwerp

TOMATIC
TEMS

When writing to Automatic Electric Inc., please mention TELEPHONY.

(*Concluded from page 26.*)

your attitude towards your work to be your attitude towards life, but when you stop to think how much of our time outside of sleeping is spent in the office, you can readily see why we should be our best daily.

Let each new ticket be a new challenge to your better self. They represent dollars—the same dollars Sinclair receives for his oil and that Ford gets for his "Tin." Oh, the importance of these seemingly little things. It takes them to make up this big whirling wheel of humanity. Even Christ emphasized the importance of the little things. You remember he said to one: "You have been faithful over a few things, I will make you ruler over many."

He came a little sooner
  Than the other fellow did,
And stayed a little longer
  Than the other fellow would.
He worked a little harder,
  And he talked a little less.
He was never really hurried,
  And he showed but little stress.
For every little movement
  His efficiency expressed.
He saved a little money
  In a hundred little ways,
And banked a little extra
  When he got a little raise.
Of course, it's little wonder that
  He murmured with a smile
As the dividends came regular,
  "Are the little things worth while?"

## My Experience in Collections From Subscribers.

By Mrs. George Winters,

*Manager and Cashier, Oklahoma Telephone Co., Hominy, Okla.*

When I assumed my duties as cashier, some of the important features in connection with my work were explained to me. They included such items as courteous and fair treatment to all of our customers, accuracy in my reports, the exercise of due caution in extending toll credit to irresponsible subscribers, and to collect in the revenue each month as near 100 per cent as possible.

At first it seemed to me this would be an easy matter, but I soon found out differently. I suspect that in most every exchange there is a number of subscribers who might properly be classed as "Slow Pay." I find this is true at Hominy, and in talking with other cashiers, they advise me that they find the same condition in their exchanges.

Every month it is necessary to disconnect some of these "slow pay" subscribers for non-payment of their accounts, although we send them a statement on the first of each month, and if their account is not paid by the 15th we call them by telephone. In some instances we call our subscribers several times before disconnecting their service, and this is especially true in the case of public officers, doctors and good responsible business concerns.

While this means additional work for me, I realize it is good policy to do it, for it demonstrates to our subscribers that we disconnect their service only as a last resort, and in most cases they appreciate this.

In several instances I am quite sure I have been able to keep from losing some of these "slow pay" customers by being very persistent in the matter of sending them statements, reconnecting them and calling them, and even visiting them at their work or in their homes and explaining to them that we do not want to lose them as a subscriber. But if I do not collect my accounts properly each month, it makes a poor showing for me personally with the company.

In some cases these subscribers are now paying their bills promptly each month without being disconnected.

We have a large number of Osage Indians as subscribers in Hominy. It took me a long time to figure out the best way to handle them, but at the present time I sometimes wish all of our subscribers were Osage Indians. Some of these accounts are paid through the Indian agency, some through their guardians and a few that are unrestricted pay their own bills. It is necessary for the Osages to approve the bills before they are paid by either the agency or their guardians.

When they refuse to approve the bills, I find it is best to leave the equipment in place in their residence, for sooner or later they will come in and either pay the bill themselves or will approve it for payment, as described. Experience has taught me that if we remove the equipment for non-payment, in most cases we never collect the bill; or if we do, it is because they feel the necessity of having service.

I find it is good policy to restrict these Osage Indian subscribers from charging tolls to their telephones, for it is necessary to disconnect them frequently for non-payment. It seems they cannot resist the temptation to run up a large toll bill; and then when they get their allowance they would rather spend the money for some luxury than pay their telephone bill.

If their telephone is restricted on toll, in most cases, they will pay their telephone rental promptly each month. I might add this same policy works out with some other classes of citizens equally as well.

There is a certain number of our subscribers that it is necessary for us to call each month before they will come in and pay, and some of these subscribers seemed to resent our calling them and reminding them of their unpaid account.

By making an individual study of these cases, I find that after becoming personally acquainted with them, when I call them on the 15th they will sometimes mention the matter to me of their own accord about paying their account. But if they do not, I visit with them about their family and other matters of personal interest, and then gently remind them of their oversight.

By working along this line, it is indeed a very rare occasion when any of my subscribers show irritation when I call them.

To sum up this brief address on collections, I believe the answer is: "A Just Policy, Fairly and Firmly Administered."

## Company in Southern Indiana Assisting Farmers in Drought.

The Southern Indiana Telephone Co., Aurora, Ind., is doing its bit to help relieve the farmers in its territory, which has been hard hit by the drought. The company published advertisements in the local newspapers to the effect that it would purchase locust suitable for poles from the farmers, thus providing a source of cash during the present drought season.

Ordinarily, one-third of the telephone lines are gone over each year, but the present plan is to advance as much of the 1931 overhauling to the present fall as is possible to get done. Not only will the telephone company purchase poles, but it plans to send one experienced man to the job of overhauling the lines, and to employ farmers in the neighborhood for the balance of the work. In this way, it will do whatever it can toward relieving the farmers in its territory.

Commenting on the plan, General Manager R. V. Achatz said that some temporary borrowing by the company of the funds to carry on the work might be necessary, but in this way, the company would be adding its credit to the general fund of credit available for relief in the area.

It is hoped to cover approximately 30 miles of line in advance before the end of the year.

## Miss Anne Barnes Resumes Traffic Work in Iowa.

Miss Anne Barnes, traveling chief operator of the Iowa Independent Telephone Association, Des Moines, Iowa, has resumed her work after an absence of several months.

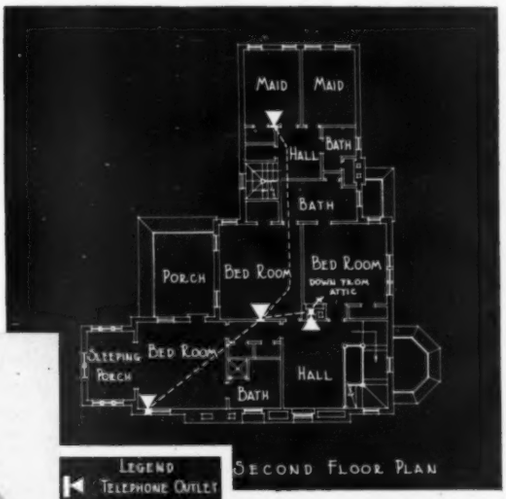
Miss Barnes spent the summer with her sisters in Springfield, Ill., recuperating from an infection of an eye, an after-effect of an attack of flu last spring. She hopes soon to be in position to resume the writing of her weekly articles which have been a feature of Telephony for a number of years.

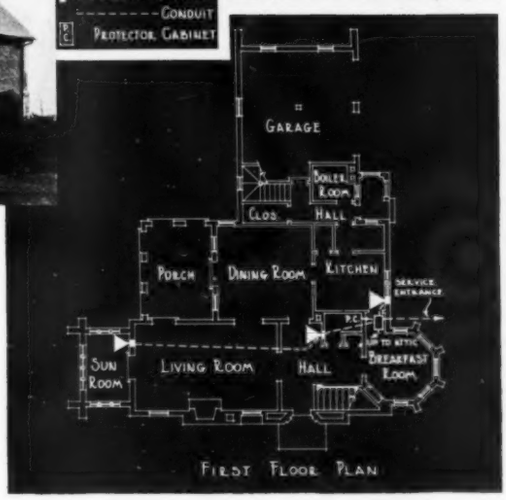
The many Iowa friends of Miss Barnes will be glad to welcome her back and those in other states will be pleased to know that she has resumed her telephone activities.

## Prices in the Metal Markets.

New York, September 2: Copper—Quiet; electrolytic spot and future, 10¾@11c. Iron—Quiet; No. 2 f. o. b. eastern Pennsylvania, $18@19.00; Buffalo, $16.00; Alabama, $11.50@14.00. Tin—Easy; spot and nearby, $29.80; future, $30.10. Lead—Steady; spot New York, 5.50c; East St. Louis, 5.35c. Zinc—Steady; East St. Louis spot and future, 4.30@4.32c. Antimony—7.62c. Quicksilver—$119.00.

# The Telephone Arrangements were Instrumental in the Sale of the House






*This house, one of a series built for sale, provides for complete telephone convenience with seven telephone outlets. Conduit built into the walls and floors during construction carries the telephone wiring. The house is located at 4731 Montrose Drive, Greenway Parks, Dallas, Texas.* FONZIE ROBERTSON and ROBERT LINSKIE, Architects, *Dallas.* GEORGE ALLEN, Builder, *Dallas.*

PROVISION for *telephone convenience* is an effective and inexpensive feature in houses built for sale. Builders are more and more appreciating the strong appeal which it has for home buyers. A prominent Texas builder writes:

"The telephone arrangements provided for in the homes I have built in Dallas were instrumental in their sale.

"In accordance with your representative's recommendations a complete conduit layout and outlet arrangement was provided which made it possible to conceal all wires. This and the very apparent convenience afforded by having telephone outlets in all the important rooms made a very favorable impression on those prospective buyers who visited these homes.

"I am now building a home for another client and have been instructed to provide conduit and facilities for modern telephone convenience. I greatly appreciate your assistance in helping me meet these new demands for living comfort."

Representatives of your local Bell Company will gladly help you in planning the telephone arrangements for your building projects. There is no charge. Just call the Business Office.

*The importance of complete telephone convenience in meeting home-buyers' demands for modern living comfort is illustrated in this advertisement, which appears this month in a group of magazines edited for builders.*

# "Floating" Batteries in Exchanges

## Trickle Charging, Originally Developed for Railway Signal Operation, Now Used in Telephone Exchanges—Storage Battery Permanently Connected to Alternating Current Through Rectifier; Advantages of This Form of Charging

By C. E. Stryker,

*Electrical Engineer, Fansteel Products Co., Inc., North Chicago, Ill.*

Alternating current is generally conceded to be the least expensive and probably the most dependable form of electrical energy. Produced in large quantities, it is cheap. Transmission at high voltage is economical and efficient. With suitable transformers, almost any desired voltage or amperage may be obtained, which makes alternating current a most flexible source of power.

Unfortunately, telephones cannot be operated directly from an alternating current supply. A very smooth and steady direct current is required. Therefore, even if at the original source, alternating current is cheaply bought and cheaply transmitted from it, much must be done to convert it to useful telephone power, so the cost often becomes a considerable item.

Is there not some source of telephone power which utilizes the cheap alternating current and at the same time provides a reserve supply?

The answer is the alternating current floating battery system, sometimes called "trickle charging." This was developed originally for railway signal operation, but is now extended to telephones, or any class of service where direct current is essential and a reserve is desired.

In this system a storage battery is permanently connected to the alternating current line, through a rectifier. The input current to the battery is so regulated that a small charge is delivered to the battery continuously; just enough to restore the power discharged in normal operation, plus a small amount of current to compensate for battery losses. Under these conditions, the battery is kept fully, or nearly fully, charged at all times, providing a maximum reserve.

Storage batteries are by no means new in the telephone industry, but they are commonly operated on a "cycle," or "charge and discharge" basis. Batteries in P. B. X. boards, for instance, are often charged through cable pairs by a generator at the central office. This is generally done at night, or during other periods when there is no traffic.

Chargers are sometimes turned on and off manually; sometimes by means of clock-operated switches; sometimes by means of a relay circuit which turns on the charger when no calls are on the board.

Frequently it is necessary to install duplicate batteries and charge one while the other operates.

This method of operation with storage batteries has never been considered 100 per cent satisfactory. A power failure might occur just at the time when batteries are in a discharged condition. Such an event would entirely defeat the purpose of battery operation. The human element forgets, or the "automatic" device fails, and a charger is left operating too long, resulting in a battery being ruined from overcharge. Damage to cable pairs from overloading is not uncommon.

Compared with cycle charging, the floating system offers the following advantages and benefits:

A more uniform voltage is maintained; absence of acid fumes; less frequent addition of water; more reserve capacity, as the battery is kept in a practically full state of charge at all times; less routine maintenance. Once the charging rate is adjusted to traffic conditions, it seldom requires attention; floated batteries, on low charge, deposit very little sediment, which never requires removal; longer battery life, because of lower charging rate; in most cases, batteries of smaller capacity may be used; and charging rates being very low as a rule, less expensive rectifiers may be used, thus saving investment in high rate charging equipment.

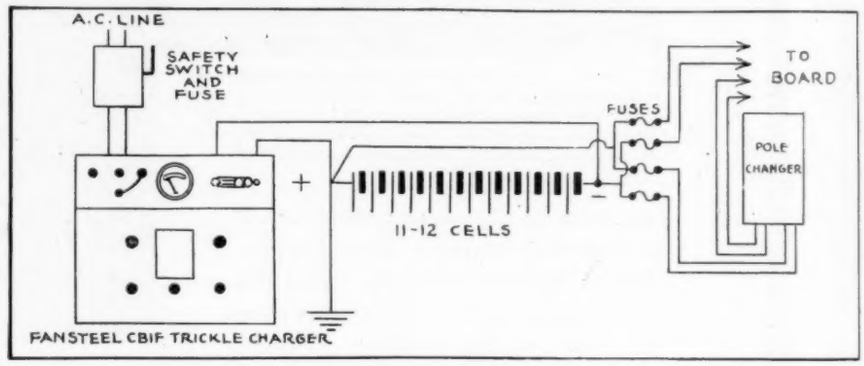
For example, a comparatively inexpensive rectifier delivering a continuous charge of six amperes is approximately equivalent to an eight-hour daily charge from a 20-ampere generator.

### Types of Rectifiers.

In floated service, a battery is charged while it operates; and this must be borne in mind when selecting rectifiers and other battery charging equipment. Only noiseless rectifiers, or rectifiers which can be made noiseless without undue expense, may be used.

Thousands of installations, many of them now operating in their fifth and sixth years of continuous service, have proved the lead-tantalum electrolytic type of rectifier thoroughly dependable and economical for telephone use.

Briefly, the principle of the electrolytic rectifier is as follows: Several metals, among them tantalum, aluminum, and tungsten, are known as "electrolytic valves," or one-way conductors in electrolytic solutions. Thus, if a piece of one of these metals is placed in solution with a piece of some other metal, such as lead, and an alternating current applied, the current will flow from the lead to the valve metal, but not in the opposite direction.




**Typical Wiring Diagram of a Floated Battery. Ringing Current Is Furnished Through Pole Changer, Thus Providing Emergency Ringing as Well as Talking Service.**

Tantalum is by far the most satisfactory metal for this purpose, for, in addition to being a valve, tantalum is not corroded, even by strong sulphuric acid. In tantalum rectifiers, the valve action begins instantly, instead of delaying until an oxide forms, as is the case with aluminum. And tantalum electrodes never require cleaning.

The tantalum rectifier manufactured by Fansteel Products Co. requires no attention other than the occasional addition of pure water. This rectifier also has the great advantage of visible operation. In other words, the presence of oxygen and hydrogen bubbles rising from the electrodes is a clear indication to the observer (1) that the alternating current supply is alive, (2) that the rectifier is functioning, and (3) that the battery is being charged.

Another advantage of this type of rectifier is that it may be overloaded with perfect safety at voltages and currents which would destroy other types. Barring a direct hit, even lightning cannot harm a Fansteel electrolytic rectifier. In case of

# "P&H" BUTT-TREATMENT

*—a leading factor in the outstanding success of*

# "P & H PROCESS" POLES

Deeper penetration of preservative, more uniform penetration, more complete saturation and greater amount of free oil in the groundline area . . . these results, so important in assuring longest pole life, are produced by the "P & H Process". Two patented features are employed—a distinctive type of power driven perforating machine and the exclusive P & H method of perforating the pole under a spray of water.

"P & H Process" Poles are guaranteed, in writing, to show a full sapwood penetration to a depth of one-half inch throughout the ground-line area. This is only one of the reasons why P & H Poles are

***"Still in the Lead"***

FAST SHIPPING SERVICE on all cedar pole requirements—Northern White Cedar or Western Red Cedar.

## PAGE AND HILL CO.

**MINNEAPOLIS, MINN.**

New York, N. Y., 50 Church St. Chicago, Ill., 20 North Wacker Drive Bldg.
Boston, Mass., 733 Public Service Bldg. Kansas City, Mo., 455 Dwight Bldg.
Pittsburgh, Pa., 1210 Grant Bldg. Dayton, O., 854 Reibold Bldg. Omaha, Neb., 711 Elec. Bldg.

***Predetermined results through laboratory control of "P&H" operations***

When writing to Page and Hill Co., please mention TELEPHONY.

Full Wave Rectifier Which Delivers Continuous Six-Ampere Charge.

such extreme overloads, the rectifier yields and breaks down momentarily, but within a fraction of a second re-forms and continues to function unless the overload is sustained.

To illustrate the point, imagine a small boy dropping a stone in a pool of water. The water breaks, but its smooth surface immediately re-forms. If, on the other hand, he drops the stone through a pane of glass, that's another story.

A single electrolytic cell is a half-wave rectifier—that is, it rectifies a 60-cycle alternating current to a pulsating direct current of 60 impulses per second. Full-wave rectification is obtained by wiring four cells into the form of a bridge.

**Setting the Charging Rate.**

Leading battery manufacturers and electrical engineers have found that charging rates are more efficiently governed by voltage than by amperage or hydrometer readings.

Careful study over a long period of years has revealed that an average reading of 2.15 volts per cell (for example, 51.6 volts for 24 cells in series) directly at the battery terminals, with the rectifier operating, will keep a battery in a healthy, charged condition.

When putting a battery into a floated service, make certain first that it is charged —that each cell's gravity is about 1.275. Then, when the rectifier has been connected, take a voltage reading and adjust the rate to 2.15 volts per cell.

Test the battery every day for at least a week under normal operating conditions. If voltage falls below 2.10, the charging rate is insufficient and should be raised. If it rises above 2.20, the charging is excessive, in which case frequent addition of water will be necessary and short battery life will result.

Momentary readings below 2.10 or above 2.20 volts are normal, and do no harm, but average readings should remain within these limits. Readings should always be taken at the battery terminals, with the rectifier operating and with a good voltmeter of known accuracy; otherwise, false readings will result. The difference of a few hundredths of a volt will make wide variations in the performance and life of the battery.

It is impossible to state at just what amperage any given battery should be charged. The work the battery is doing, the temperature, the age and condition of the battery are all governing factors. However, if the battery is charged by voltage, as recommended, these conditions will automatically adjust themselves.

Improved Electrolytic Condenser of Large Capacity Employing Tantalum Metal Plates, Eliminates Hum from Transmitting Circuit, Enabling Batteries to Be Charged While They Operate.

Once the charging rate is set and the battery voltage remains between 2.10 and 2.20 volts per cell, no further adjustment is necessary, provided the rectifier is of a type which does not lower in charging rate with age or vary with temperature.

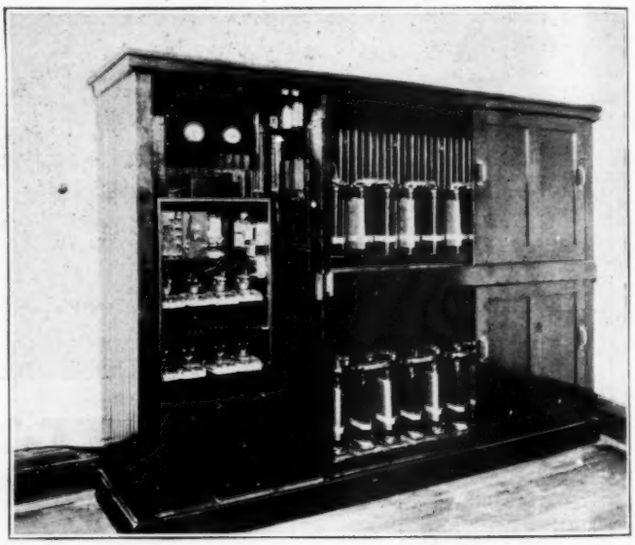
In case the battery is heavily discharged, or becomes discharged through alternating current line failure, the rectifier will in time restore the battery to normal. In a discharged condition, the lowered battery voltage offers less resistance to the impressed current from the rectifier. This hastens charging, and as the battery becomes charged, the increasing resistance tends to prevent overcharging.

However, it may be desired to charge the battery quickly. With a good electrolytic rectifier, resistance may be cut out or voltage increased to deliver a charge several times the normal capacity of the rectifier without injury. Heating of the rectifier cell does nothing except consume water, which is easily replaced when normal charging is resumed. Overheating of transformers, however, should be guarded against.

**Noise in Transmitting Circuits.**

In the past, one problem in the alternating current floating battery system of telephone operation has been noise in transmission circuits. Regular full-wave chargers could not be used, due to the hum caused by the pulsating nature of the rectified current. This hum was sometimes eliminated by inserting a choke coil in the charger lead, but such a method is inefficient because of the excess rectifier voltage required to overcome the loss through the choke.

A very efficient type of filter has been worked out, however, which consists of a high capacity condenser and a choke coil. The rectifier voltage needs only a very small increase when using this form of filter, giving practically the same efficiency with or without the filter. This type of filter eliminates hum, even when batteries are being charged at rates as high as six amperes.



Compact Cabinet Which Houses Complete Power Plant for P. B. X. Board at Large University. The 48-Volt Battery (Right) Is Kept at Full Charge by Charger in the Left Compartment. Filter Circuit Eliminates All Hum.

Electrolytic condensers have been found best for this purpose, since they provide high capacity in small space, and are self-healing. An improved form of electrolytic condenser employs the non-corrodible metal, tantalum. This condenser cannot be harmed by electrical overloads and does not require cleaning.

**Semi-Floated Batteries—Low Cost.**

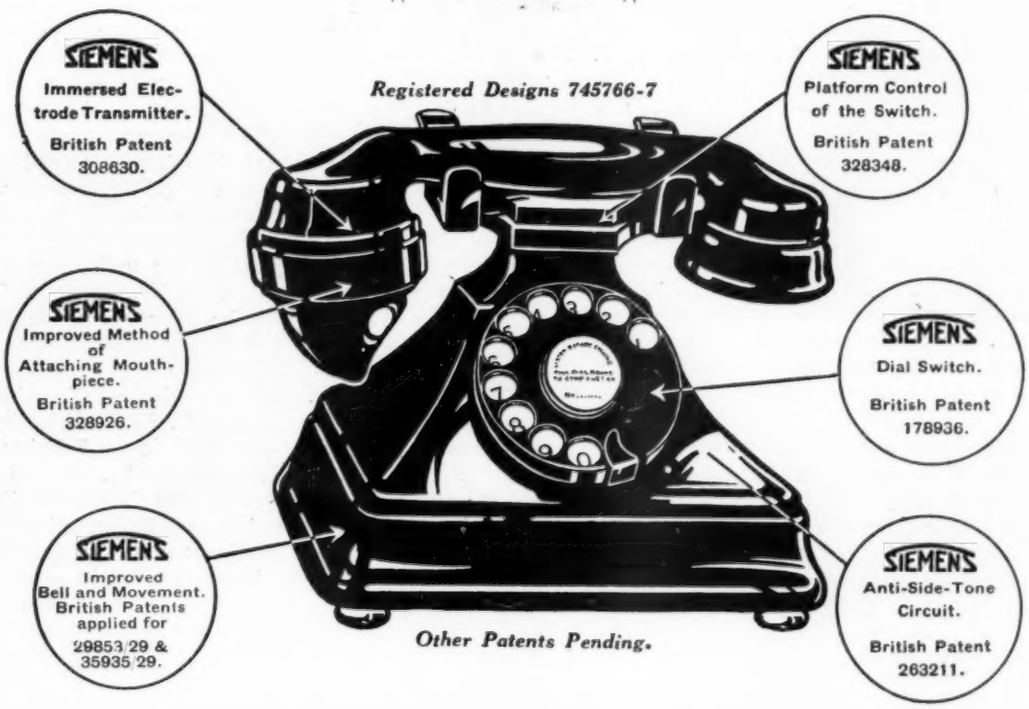
An outstanding advantage of the floating battery system which should not be overlooked is the very low plant investment required.

Where rectifiers are installed in subscribers' P. B. X. boards, meters may be installed, or flat-rate arrangements made with the subscriber to pay for the charg-

# SIEMENS

# "NEOPHONE"

PATENTED IN ALL COUNTRIES




**THE MOST EFFICIENT TELEPHONE IN THE WORLD.**

OTHER microtelephone instruments may also be attractive in appearance and convenient to use, but the "Neophone" is **definitely superior as regards speech transmission efficiency and articulation**, due to the unique features indicated above.

It is for these reasons that it has been standardized by the British Post Office and the Union of South Africa, as well as adopted by many other important overseas telephone administrations.

***Full particulars from the SOLE MANUFACTURERS***

**SIEMENS BROTHERS & CO., LTD.**
**WOOLWICH, LONDON, ENGLAND**

ing current. Both these methods are being carried out successfully.

In medium-sized or even large cities, where all telephone power comes from one generator which charges batteries also, an economical method of operation is to float the batteries on rectifiers and shut down the generator at night, or at other periods when traffic is not heavy.

Such an arrangement saves wear and tear on the generator, saves labor, and keeps the batteries in better condition.

Where telephone companies have changed over part or all their plant to the alternating current floating battery system, important savings in power cost are an immediate and notable result. Batteries require less maintenance and last longer because the low, even charging rate deposits less sediment. Investment in duplicate batteries is eliminated. Cable pairs are released for revenue-producing service. Service interruptions are a minimum.

In more than one case, these combined savings have lowered power costs as much as 50 per cent. One company, operating a fire and burglar alarm service, reports an annual saving of $6,000 in one district alone as a result of lowered duplicate battery investment and lowered maintenance costs. This annual saving, now going into its sixth year, has repaid the cost of the rectifiers many times over.

And no matter how storage batteries are being used, important savings can be made in almost every case by "float" or trickle charging.

### Iowa's Convention Dates for 1931 Announced.

April 7, 8 and 9 are the dates scheduled for the 1931 annual convention of the Iowa Independent Telephone Association, which will be held at the Hotel Fort Des Moines, Des Moines.

Chas. C. Deering is secretary-treasurer of the association. His announcing the dates thus early indicates that efforts are under way to make the next Iowa meeting "better than ever."

### Associated Telephone Utilities Co. Regrouping Its Operating Units.

Plans for further consolidations of operating companies of the Associated Telephone Utilities system will be carried to completion during the remainder of 1930, according to an announcement made on September 2.

The consolidation plan will result in grouping the operating companies so that there will be one large operating unit in each of the 20 states in which the system serves. Increased efficiency of management and additional economies in operation are expected to result from the plan.

Consolidations have already been practically completed in Illinois, served by Illinois Commercial Telephone Co.; in Wisconsin, served by Commonwealth Telephone Co.; in Iowa, served by Iowa State Telephone Co.; in Missouri, served by Central Missouri Telephone Co.; in Idaho and Washington, served by the Interstate Utilities Co., and in California, served by Associated Telephone Co., Ltd.

Regrouping is being effected in New York, Pennsylvania, Ohio, Indiana, Michigan, Oklahoma and Texas.

### Texas Association Plans Fine District Meeting at Tyler.

The third district meeting of the Texas Independent Telephone Association will be held at the Blackstone Hotel in Tyler, Texas, on September 18 and 19. There are 219 Independent telephone exchanges located in the Tyler district which comprises all of East Texas. It is expected that a large number will attend this meeting which will be held in the home town of former association president, R. B. Still. It is also the headquarters for the Gulf States Telephone Co.

Elaborate arrangements are being made by the officials of the Gulf States company to entertain the visiting telephone people. A genuine east Texas chicken barbecue will be given at Burns Lake, near Tyler, where swimming can be enjoyed also.

President L. S. Gardner, of Waco, will call the meeting to order at 1:30 o'clock Thursday afternoon, September 18, at the Blackstone Hotel.

On September 19 the traffic session will be held. It will convene at 9 o'clock and continue until 1 p. m. The barbecue will be held at 1:30 o'clock on Friday afternoon.

Among those who will appear on the program will be Judge S. A. Lindsay, Tyler, president, Gulf States Telephone Co.; L. S. Gardner, Waco, president, Texas Independent Telephone Association; Sam H. Shutt, Waco, general superintendent, Texas Long Distance Telephone Co.; Oscar Burton, general manager, Gulf States Telephone Co., Tyler; E. P. Seaman, Georgetown, district manager, Southwest Telephone Co., and H. A. White, Kansas City, Mo., manager, Kansas City branch, American Electric Co., Inc.

The following will take part in the program of the traffic session: W. C. Edwards, Dallas, director, Texas Public Service Information Bureau; Lon J. Darley, Dallas, vice-president, Three States Telephone Co.; Mrs. Phebe Brown, chief operator, Home City Telephone Co., Athens; R. H. Cornish, Commerce, manager, Gulf States Telephone Co.; Miss Elizabeth Harllee, chief operator, Southwestern Bell Telephone Co., Corsicana, and H. B. Whatley, toll service supervisor, Southwestern Bell Telephone Co., Dallas.

Two more district meetings have been planned by the Texas association. One at Waco on October 23 and 24, and one at Abilene on November 20 and 21.

# With the Manufacturers and Jobbers

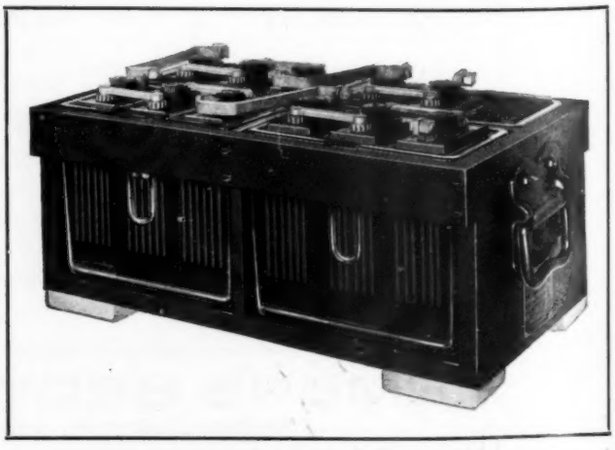
### Exide Sealed Glass Jar Storage Batteries, Type BTE.

The Exide battery, Type BTE, in sealed glass jars is a recent development of the Electric Storage Battery Co. It is particularly adapted to telephone services such as magneto, P. B. X., and small common battery switchboards.

This battery is assembled in a three-compartment glass-jar unit of rugged construction, and is mounted in a wood crate painted with acid-resisting paint, equipped with pressed steel handles and porcelain insulator skids.

An 11-cell battery of this type consists of four three-cell units, in one unit of which one compartment is blocked out, and sealed with a painted wooden cover. Two different assemblies are provided, i. e., either in two crates (overall dimensions; length, 12 1/16 ins.; width, 12 ins., and height, 9⅞ ins. per crate), or all in one crate (overall dimensions: Length, 21⅞ ins.; width, 12 ins.; height, 9⅞ ins.), in order to conform to different installation requirement.

This battery is available in two sizes, one with 14.4 ampere hours capacity at the eight-



The New Sealed Glass Jar Exide Battery.

# Backing up the Telephone—

*The Man in the Iron Mask*—electro-welding a switchboard frame—is one of many skilled workers who see that every part is made right.

*Wire Enough in a Single Telephone Exchange* to span the United States three and a quarter times!

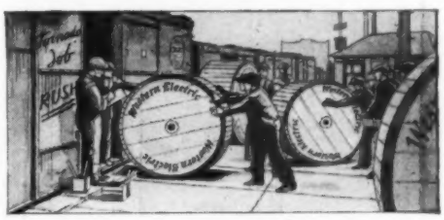
## To make the telephone

and back it up with all the apparatus and supplies needed for nation-wide service is a work of infinite variety.

Buying rubber from Singapore, mica from India, conduit from Ohio—Making each year a million telephones, 15,000 miles of cable, switchboards by the trainload—Distributing supplies to 32 warehouses, holding them ready for the telephone companies of the Bell System—Installing the equipment in all their telephone exchanges—

All this is the responsibility of Western Electric—whose dependable service of supply helps make possible dependable telephone service.

*From Pencils to Telephone Poles* everything the Bell Telephone System uses is found in Western Electric's market basket.




*Meeting Emergencies* is the real test of a service. Western Electric's system of supply distribution is always ready!

# Western Electric

*Manufacturers...Purchasers...Distributors*

SINCE 1882 FOR THE BELL SYSTEM

When writing to Western Electric Co please mention TELEPHONY.

# Correct Balance

THE Zinc and the active material are so correctly balanced in every Storm King Telephone Battery that there is no appreciable waste of either when the cell ultimately fails to operate.

This economy of materials means economy in manufacture and consequent low cost in proportion to the efficiency of the Battery.

Total efficiency is increased by the D-W patented paper-thin insulator and the extra quantity of active material admitted by this construction.

PATENTS

**GENERAL DRY BATTERIES**

INCORPORATED

**CLEVELAND, O.**

Makers of all types of dependable Dry Batteries for Radio, Ignition, Flashlight and General Use.

hour rate, and the other with 21.6 ampere-hours capacity at the eight-hour rate. Each 11-cell battery has one of the units equipped with pilot balls to give a rough indication of the state of charge.

Low gravity electrolyte (1.220 specific gravity) is used. This lengthens the life of the battery. Generous sediment space is provided below the plates. The terminal cells are equipped with bolt connectors for making external connections. The units in each crate are connected with lead tape, which is also used for connecting the units of the two-crate assembly.

Each crate is provided with skids which allow a free circulation of air under each unit, and insulates it from the floor or shelf on which it is mounted. The spray-proof vents, with which each cell is provided, permit of the battery being located in the same room with the telephone switchboards and other apparatus. The battery is furnished, filled with electrolyte and charged, ready for service.

## Type of Pole Roof Optional on International Poles.

The International Creosoting Construction Co., Galveston, Texas, has sent out a circular letter describing the new type of pole roof that many of the utility companies are standardizing upon. As has been referred to previously in TELEPHONY, this is a one-way roof of 15-degree angle with the horizontal, and the cut so made that it drains water away from the gain.

The advantages claimed for this one-sided roof are that it reduces checking, provides better drainage and conserves the preservative.

The Bell system, the Electric Bond & Share Co., and many other utility companies are said to have standardized on this one-way roof.

The International Creosoting & Construction Co. leaves the matter of roof for International poles optional with the customer.

## Four Exchanges to Install Stromberg-Carlson Equipment.

The Texas Associated Telephone Co., of San Antonio, recently contracted for two two-section junior multiple switchboards for its Raymondsville and La Feria exchanges with the Stromberg-Carlson Telephone Mfg. Co., according to a report from that company. The switchboard for Raymondsville consists of 300 central energy, 24 rural and 16 toll lines, and the La Feria board consists of 170 central energy, 16 rural and eight toll lines. Both switchboards will be complete with power, machine and terminal equipment.

Three sections of the No. 3 unit type Stromberg-Carlson switchboard have been purchased by the General Engineering & Construction Co., of Salina, Kans., for its exchange at Taft, Texas. It consists of 300 central energy, 30 rural and 10 toll lines. It also will be complete with power, machine and terminal equipment.

The Northern Ohio Telephone Co., of Bellevue, Ohio, has purchased six sections of No. 3 unit type Stromberg-Carlson switchboard for Medina, Ohio, consisting of 500 central energy, 80 rural and 30 toll lines. It is complete with power, machine and terminal equipment.

## Golf Party of George Rodormer, of Reliable Electric Co.

Some good golf and some bad was played by 40 telephone men at the Park Ridge Country Club, Park Ridge, Ill., on August 28. The event was made possible by George Rodormer, vice-president of the Reliable Electric Co., Chicago, who was host to the enthusiastic group, all members of which voted the affair a huge success.

Gathering at the club at noon for lunch, 18 holes of golf followed. After dinner the prizes were awarded. S. A. Monteer of Kellogg Switchboard & Supply Co. took first low net with 99-30—69. Geo. Watts, Knightstown Telephone Co., Knightstown, Ind., received a useful prize for second low net, shooting 88-16—72. Next came John E. Fisher, of the American Electric Co., Inc., with 97-24—73.

There was a tie for fourth low net between Frank Eldridge and Hi. Fargo, Jr., of TELEPHONY, the former being the best guesser on the toss. John Coffey, Coffey System & Audit Co., was presented with a many-colored parasol with which he was instructed to protect his new hundred dollar golf bag.

Those who had the good fortune to attend the outdoor party were:

H. O. Leinard, Cleveland, Ohio; George A. Yanochowski, Chicago; H. E. Billington, Chicago; J. F. O'Connell, Madison, Wis.; Geo. X. Cannon, Freeport, Ill.; John F. Kent, Chicago; Geo. W. Rodormer, Chicago; S. L. Odegard, Los Angeles, Calif.; D. J. Gillespie, Chicago; E. W. Rodormer, Chicago; W. F. Benoist, Chicago; Dr. O. M. Vaughn, South Haven, Mich.; M. A. Bellion, Chicago; John Campbell, Genoa, Ill.; J. B. Cook, Chicago.

W. L. Cook, Chicago; J. W. Coffey, Indianapolis, Ind.; H. W. Hogue, Indianapolis, Ind.; F. L. Eldridge, Chicago; S. A. Monteer, Chicago; Geo. Watts, Knightstown, Ind.; John E. Fisher, Chicago; R. H. Burfeind, Chicago; H. D. Fargo, Jr., Chicago; Roy W. Siemund, Chicago; R. H. Coyne, Chicago; Richard F. Pagles, Park Ridge, Ill., and W. H. Green, Pekin, Ill.

There were several others invited, but they were unable to be present. Frank Eldridge made a motion after dinner to offer a vote of thanks to the host, Mr. Rodormer, which was promptly seconded and unanimously carried.

Howard Leinard, of Cleveland, Ohio, declared he thought the course one of the

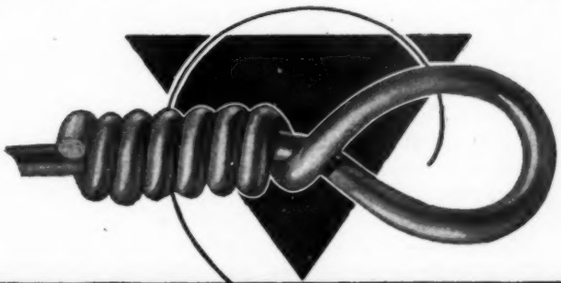
# Millions of Miles of Uniformity

Throughout the nation—in a big city, small hamlet or across open country—Perfected Telephone, Telegraph Wires and Strand are playing a major part in the efficient operation of communication systems.

Made by the American Steel & Wire Company, these better products are constantly uniform, heavily galvanized to resist weather and destructive fumes—and have a conductivity and tensile strength to meet particular requirements.

## PERFECTED

### TELEPHONE, TELEGRAPH WIRES AND STRAND



*The smooth, deeply laid zinc is as flexible as the wire itself, assuring impenetrable protection.*

*Produced in the standard reliable brands "Extra BB", "BB" and "Steel" as well as "Copper Bearing"*

## AMERICAN STEEL & WIRE COMPANY

SUBSIDIARY UNITED STATES STEEL CORPORATION

208 S. La Salle Street, Chicago — 30 Church Street, New York

*Other Sales Offices:* Atlanta Baltimore Birmingham Boston Buffalo Cincinnati Cleveland Dallas Denver Detroit Kansas City Memphis Milwaukee Minneapolis-St. Paul Oklahoma City Philadelphia Pittsburgh Salt Lake City St. Louis Wilkes-Barre Worcester

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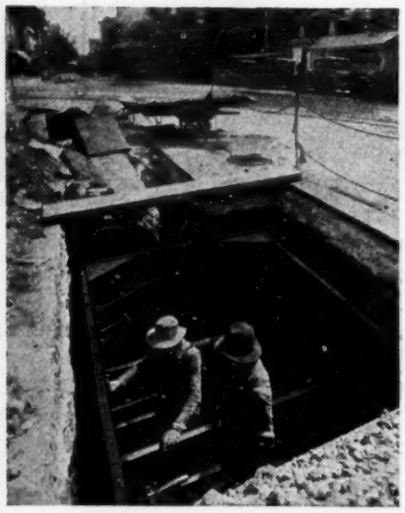
# Penote Universal Manhole Forms are Indestructible



PENOTE Manhole Forms, built of husky steel and joined by a patented method may be used hundreds of times without appreciable wear. In fact, some of the first of these forms, built a number of years ago, are still in use today, after a long period of continuous service. Think what a saving this means!

## And one set of forms builds many sizes of Concrete Manholes

Penote "Universal" Forms are composed of but one set of sections adjustable to meet requirements. They build to A. T. & T. Company's specifications the following manholes.

Type "A"—3 ft. 6 ins. wide, 8 ft. long, 5 ft. 6 ins. headroom.
Type "B"—3 ft. 6 ins. wide, 6 ft. long, 5 ft. headroom.
Type "J-3"—3 ft. 6 ins. wide, 8 ft. 6 ins. long, 5 ft. 6 ins. headroom.
Type "J-4"—4 ft. wide, 8 ft., 8 ft. 6 ins. or 9 ft. long and 5 ft. 6 ins. headroom.

Indestructible, flexible, quick to install, Penote "Universal" Forms save time and material and speed up the work. Write for full information.

THE CLEVELAND TRENCHER COMPANY
20100 St. Clair Avenue
Cleveland, Ohio


best he had ever played—it was his third game of golf and he shot 122, a decidedly lower score than his first attempt. Roy W. Siemund, American Electric Co., Inc., also made a substantial reduction in his previous scores and was pleased with the course.

## New Dial Telephone Exchanges for Dominican Republic.

The Dominican Republic is following in the footsteps of its friend and neighbor on the island of Haiti, the Republic of Haiti, as well as many of its larger neighbors on the South American continent, by adopting Strowger dial operation for the telephone systems of some of its more important cities.

Equipment is now being manufactured by Automatic Electric Inc., Chicago, for three of these, namely Santiago, Puerta Plata and San Pedro de Macoris. The record of Strowger operation for Port au Prince, Haiti, where climatic and racial conditions are quite similar to those in the Dominican Republic, it is stated, undoubtedly was a deciding factor in the decision of the officials to adopt this modern system of telephone operation.

Entirely new outside plant for the entire undertaking is being built under the direction of the Automatic Electric Co., Ltd., through which company the automatic equipment also is being supplied. The program is not a rehabilitation plan, but consists of entirely new construction and installation in all three cities, and marks a definite step forward in the progress of this republic.

The equipment for Santiago will consist initially of 400 lines of Strowger dial apparatus. Self-aligning plunger-type line switches will be used, arranged for individual and two-party line service. The usual reverting call switches will be provided. A one-position toll board is also being furnished, designed to provide C. L. R. service from the "0" level of the selectors.

Vibrating type ringing machines will furnish the ringing current. The power equipment will consist of the usual storage battery which will be maintained in a charged condition by a 12-ampere rectifier, operating from the commercial current of 110 volts, 60-cycle, single-phase.

Puerta Plata will be provided with Strowger equipment of a similar nature, consisting of 200 lines of apparatus, and a one-position toll board. Self-aligning plunger-type line switches will be furnished. Ample provisions for expansion are provided, both in this exchange and the Santiago exchange.

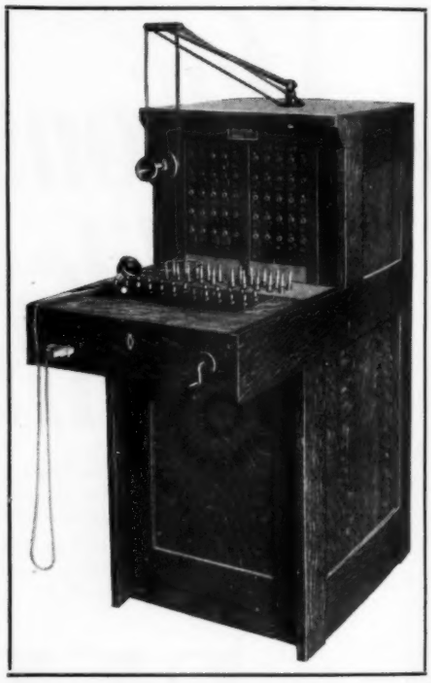
The present telephone density of these cities is quite low, and it is anticipated that the modernization of the facilities in these communities will do much toward increasing the use of the telephone among the citizens, and lead to considerable additional requirements in the near future.

The exchange equipment for San Pedro de Macoris will be of similar size to that for Puerta Plata, namely 200 lines initially. A one-position toll board is to be furnished. It might be mentioned that in all three cases the toll operator also handles the complaint and information calls. The subscriber obtains such service by dialing "0," the same as for a toll call.

## New Kellogg Magneto Switchboard Installed in Wellsboro, Pa.

The Tioga County Bell Telephone Co., of Wellsboro, Pa., recently installed a new magneto switchboard which was ordered from the Kellogg Switchboard & Supply Co., of Chicago, Ill.

The new switchboard is of the floor type with low keyshelf. It is wired to its ultimate capacity of 50 lines, with 10 cord circuits, an operator's telephone circuit, and a night alarm circuit with control key. The board is also equipped with a heavy-duty hand generator with switching key for power ringing.



Fifty-Line Kellogg Magneto Switchboard of Type Installed in Wellsboro, Pa.

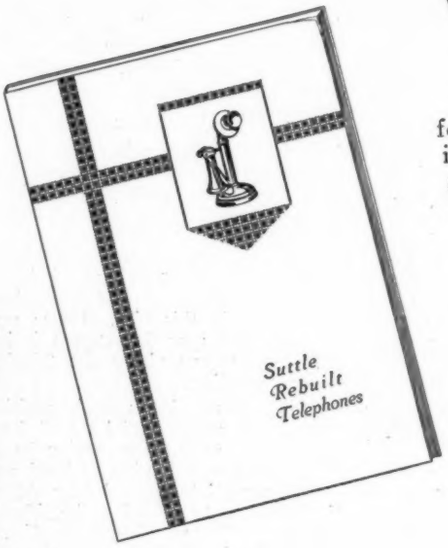
The new Kellogg board is equipped with 45 local line circuits, five line circuits for rural and toll connections, ten double lamp supervision cord circuits, and a suspended type operator's transmitter. The cabinet housing this equipment is of beautifully-grained, medium-dark, quarter-sawed oak.

## Junior Multiple Board for Exchange at Winthrop, Me.

The Lewiston, Greene & Monmouth Telephone Co. of Winthrop, Me., recently ordered a two-position junior multiple switchboard from the Stromberg-Carlson Telephone Mfg. Co. of Rochester, N. Y. The board will consist of 200 lines and will be complete with power, machine and terminal equipment.

# Suttle Equipment Co.

FACTORY AND MAIN OFFICE
Lawrenceville, Illinois




## What Makes a Telephone a "Good Buy"?

This new book, just off the press, will show you what to look for in a telephone to determine its transmission efficiency and its potential service. It is chock-full of details about construction and the little points in design that make for better service.

It is a very helpful book to the man who has to decide on buying telephones. Send the coupon for a free copy.

SUTTLE EQUIPMENT CO.
Lawrenceville, Ill.

Please send me without obligation your new book on telephones.

Name .....

Address .....

Mgr. .....

## TELEPHONE WIRES & CABLES

Electrolytic Copper Rods

Bare and Insulated Copper Wires

Switchboard Cables

Rubber Insulated Wires

Magnet Wire Flexible Cords

Enamelled Wire

Power Cables

**Eugene F. Phillips Electrical Works Limited**

(*Established* 1889)

Montreal, Canada

Factories—Montreal and Brockville

## TELERING

**For Central Office and PBX Ringing**
**IN USE ALL OVER THE WORLD**

**ONE REED!**

**ONE CONTACT!**

**IDEAL WAVE FORM**

**REDUCE YOUR RINGING COST**

**ORDER ONE ON TRIAL**

**More power than you need.**
**IT PAYS FOR ITSELF**

**Converts 60 Cycle Lighting Current to 20 Cycle Ringing Current**

**POSITIVELY NO RADIO INTERFERENCE**

**Very low current consumption.**

**Price $44.00 — F. O. B. Elyria**
**Fully Guaranteed.**

***Sold by Leading Telephone Distributors***

**TELKOR, INC., ELYRIA, OHIO**

***(Write for booklet)***

# Condensed Telephone News

Officers of Companies Are Urgently Requested to Forward to Us Promptly All Financial and Other Statements as Soon as Issued and Any Items Relating to Construction, Rebuilding, or Changes in Their Plants and Systems

### New Incorporations and New Telephone Companies.

SACRAMENTO, CALIF.—Articles of incorporation of the Transpacific Communication Company, Ltd., with headquarters in San Francisco, were filed on August 16 with the secretary of state. The company, capitalized at $25,000, is a subsidiary of the American Telephone & Telegraph Co., which plans to establish radio and wire communication between the Pacific Coast and Hawaii.

DOVER, DEL.—Telephone and Telegraphs Inc., of Wilmington, Del., was incorporated on August 25 with 2,000 shares of common stock. It will deal in investments. The incorporation papers were filed by the Corporation Trust Co.

### Franchises.

ELIZABETHTOWN, KY. — The Hardin County Telephone Co. has been granted a 20-year franchise for the construction, maintenance and operation of a telephone system in Elizabethtown.

The monthly rates to apply during the existence of this franchise are as follows: Business, one-party line, $4.75; business, two-party, $3.75; residence, one-party, $2.75; residence, two-party, $2.25; residence, four-party, $1.75; business extension, $1.00; residence extension, 50c.

### Financial.

ROANN, IND.—Articles increasing the capital stock of the Miami-Wabash County Telephone Co., Inc., 1,000 shares were filed with the county recorder on August 25. The stock is common and listed as of no par value.

The company was recently organized and took over several small exchanges in Wabash and Miami counties.

SOUTH HAVEN, MICH.—The Tri-county Telephone Co. has been granted authority to increase its capital from $1,250,000 common and $250,000 preferred to $1,250,000 common, $250,000 first preferred and $2,000,000 class A stock.

### Construction.

ALEDO, ILL.—The Western Illinois Telephone Co., subsidiary of the Central West Public Service Co., owner of the local telephone exchange, will spend between $30,000 and $40,000 upon improvements of the system in this community, Frank Milhollan, president of the Central West company recently announced.

Crews of workmen are scheduled to begin the rebuilding of the system in the business district with underground lines and remodeling of the building at Fifth and Maple streets about September 10.

HOLLIS, OKLA.—The Southwest Telephone Co., with 35 exchanges in Oklahoma, has recently improved its exchanges at Hollis, Frederick, Texola and Loveland, according to D. T. Strickland, of Dallas, Texas, vice-president.

At Hollis, 40,000 feet of cable and other improvements have been installed, and approximately 12 miles of metallic rural lines have been built at Frederick. Additions have been made to outside plant at Texola, including construction of 3,000 feet of new cable. New central office equipment and a new switchboard have also been installed at Texola. The plant at Loveland, has been rebuilt, including the placing of 1,500 feet of cable and the metallicizing of present grounded lines.

NEW YORK, N. Y.—The board of directors of the New York Telephone Co. at its monthly meeting, August 27, authorized the expenditure of $5,878,340 for new construction throughout its territory, according to an announcement made by J. S. McCulloh, president. This amount brings the total appropriation for this purpose since the beginning of the year to $67,736,435, of which $56,676,585 has been provided for the extension of telephone facilities in the metropolitan area of New York.

### Miscellaneous.

DENISON, IOWA.—Dell H. Elwell, who has been manager of the Crawford County Telephone Co. for many years, has been advanced to district manager for the Western Telephone Corp., which recently acquired the properties of the Crawford County company. Mr. Elwell will have supervision of the exchanges in Ida Grove, Battle Creek, Gowrie, Denison, Dow City and Charter Oak.

ADA, OHIO.—The Ada Telephone Exchange Co., including telephone exchanges of Ada, Alger, Dunkirk, and Harrod, is now a part of the Telephone Engineering & Management Co., recently incorporated to operate all telephone companies of the Utilities Service Co.

George B. Quatman, Lima, is president; Everett W. Sweezy, Alliance, vice-president; W. E. Hanmaker, Canton, secretary, and A. G. Vandemark, Alliance, treasurer.

The company was organized as a holding concern, subsidiary of the Utilities Service Co. to manage the 50 telephone properties owned and controlled by Suburban Light & Power Co., the parent holding company.

NEW LONDON, OHIO.—The Clarksfield Telephone Exchange has appointed a committee for the purpose of opening negotiations to merge with the Northern Ohio Telephone Co. They will get their service through the New London exchange.

KINGSFISHER, OKLA. — Billing headquarters for all exchanges of the Western Telephone Corp. of Oklahoma have been established in this city. Office equipment to house the new department is being installed in rooms above the telephone exchange building.

CLARKSVILLE, TEXAS.—A petition containing 147 names has been filed with the city council asking that action be taken to bring about a reduction in local rates.

The council instructed City Attorney B. F. Edwards to examine the franchise of the Two States Telephone Co., which serves the local territory, to ascertain if action could be taken in accordance with this request.


**FINANCE For the Future**

**The men of this company have had thirty years of experience in the telephone and general utility business. They probably have faced just the problems you are encountering right now.**

**The Public Utilities Department of this company is at your service if you wish to plan for the future. Not only do we offer financial service, but advertising and publicity service, accounting, taxation, management, engineering, bookkeeping and appraisals as well.**

**PUBLIC UTILITIES DEPARTMENT**

*The* United Trust Company

**ABILENE, KANSAS**

***Fill in the coupon below. It will bring you our booklet "A Complete Service" and special information on your most pressing problem.***

**Name** .....

**Address** .....

**My particular problem is** .....

"Telephony's" Engineering Data.
By B. C. BURDEN.

Index, Transmission Data.
August 30, 1930.
No. 6-A, Page 1.

## Transmission Methods Used in England.

### General.

It is interesting to consider the transmission practices that are in use in England. Until recent years, transmission testing in England utilized the mile of standard cable as the unit of comparison. Artificial cable boxes similar to those formerly used in this country were used for testing work. The 800-cycle mile unit was adopted to replace the M. S. C. unit and the D. B. unit has to a large extent replaced the 800-cycle mile unit.

An elaborate system of primary standard reference substation sets is maintained. In checking these substation sets, they point out the importance of the use of several speakers and listeners in order to prevent error due to personal characteristics. Although a "constant sound generator" has been tried to avoid the personal equation, they have in general been found unfavorable, due to the tendency of the transmitter granules to pack.

### Testing Equipment and Procedure.

English engineers have said that they "believe a speech test is the ultimate criterion of the efficiency of any telephone apparatus, or circuit." However, for practical reasons they have found alternating current testing the most useful.

Their method of testing with the voice is the same as that used in America, viz.: a comparison of the received volume through the actual line to that through a calibrated artificial circuit.

They test transmitters for volume efficiency, resistance, frying, side tone, packing and articulation.

The volume test is made by comparing the volume received over a standard subset set-up, with that received over a similar arrangement in which the standard transmitter is replaced by the transmitter under test.

For the testing of local battery transmitters, they use a local battery circuit on the transmitting end, and the regular standard receiving circuit on the other end. They make use of a special battery circuit which utilizes two cells of storage battery connected as shown in Fig. 1, as an equivalent of two average dry cells. They obtain the resistance of the transmitter by measuring the voltage drop across it, and the current through it. This measurement, of course, requires a high resistance voltmeter to avoid error.

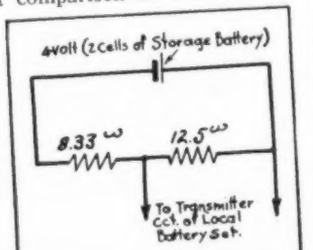


Fig1. CIRCUIT FOR OBTAINING EQUIVALENT OF TWO AVERAGE DRY CELLS.

Frying is measured by listening for indication of this

(Over)

"Telephony's" Engineering Data.
By B. C BURDEN.

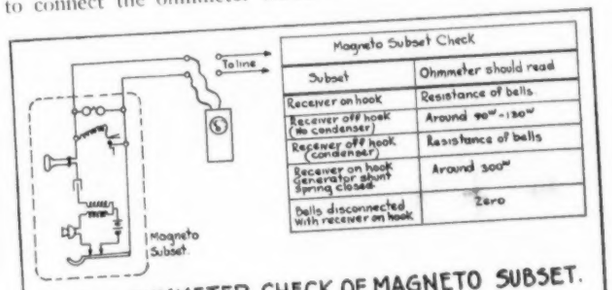
Index, Maintenance Practices.
August 30, 1930.
No. 1-C, Page 1.

## Uses of the Ohmmeter.

### General.

The uses to which the ohmmeter described in data sheet No. 2-A can be put are innumerable. Its chief use is in the measuring of circuit resistance of apparatus or lines. Faults due to short-circuiting, grounding, high-resistance joints, etc., are quickly noted by their effect on the resistance of the circuit.

For example, in checking up on a magneto telephone, Fig. 1, to see if it is in normal condition, it is only necessary to connect the ohmmeter across the line posts of the telephone with one of line wires disconnected and note the reading. With the receiver on the hook the reading obtained should be that corresponding to the resistance of the ringer coils (about 1,600 ohms).




Magneto Subset Check

| Subset | Ohmmeter should read |
|---|---|
| Receiver on hook | Resistance of bells |
| Receiver off hook (no condenser) | Around 90ω-130ω |
| Receiver off hook (condenser) | Resistance of bells |
| Receiver on hook generator shunt spring closed | Around 300ω |
| Bells disconnected with receiver on hook | Zero |

Fig1. OHMMETER CHECK OF MAGNETO SUBSET.

If a materially lower reading is obtained, it is evident that either the generator shunt spring is not opening properly, or that the receiver hook spring does not open and close as it should. If these are checked and found to be O. K., then carbonized insulation in the hook switch or form wiring should be looked for. The spring assembly on the end of a generator may in itself be all right, but the bushings which hold it to the generator may be broken down and should be examined.

Trouble location is facilitated by leaving the meter connected and feeling around the different wiring of the telephone set. Usually some variation in the resistance will be noted unless the fault is a solid one.

Poor contacts or high resistance connectors in the instrument are readily detected by the same method of leaving the ohmmeter across the line terminals or portion of the circuit in trouble, and then noting fluctuations when the different parts are touched.

Short-circuited non-ring-through condensers in the receiver circuit are detected by connecting the ohmmeter to the line posts and noting whether the resistance changes

(Over)

## Explanation of the Arrangement of "Telephony's Engineering Data Sheets."

The general layout of TELEPHONY's Engineering Data Sheets is as follows:

In the upper right hand corner of each data sheet are given the file subject, date of issue, index number and page number.

The file subject is a general head with a class suffix. The index number refers to the specific subject covered in the data sheet, while the letter refers to the class, as to design, maintenance, or construction.

The letters designate the classes as follows: (A) indicates design; (B) indicates construction, and (C) indicates maintenance.

The page numbers are of value in properly locating pages on the same subject.

As an example of the system, under Pole Plant Design these subjects would be found:

No. 1-A. General Theory.
No. 2-A. Pole Strength Formulae.
No. 3-A. Design Tables for Rural Leads.
No. 4.-A. New Line Design.
No. 5-A. Pole Line Repair.

Under Pole Plant Construction would be:

No. 1-B. Pole Framing.
No. 2-B. Hole Digging.
No. 3-B. Pole Setting.
No. 4-B. Pole Fitting.
No. 5-B. Special Construction.

Under Pole Plant Maintenance would be:

No. 1-C. General Plan.
No. 2-C. Standard Methods.
No. 3-C. Plan for Small Plants.
No. 4-C. Emergency and Storm Repair.

These, of course, are only a few of the subjects which will be covered in TELEPHONY's Engineering Data Sheets. They are, however, sufficient to indicate the method followed in indexing the great amount of information relative to the telephone business which will be presented on these sheets which are published each week in TELEPHONY.

trouble when the transmitter is used on a minimum equivalent loop resistance.

Side tone is tested by comparison with the side tone in the standard subscriber's set.

Packing is tested by observing the resistance change, if any, after speaking into the transmitter in a low tone.

Articulation tests are made by repeating certain words and having the distant observer record the received sounds. The test is repeated on a standard transmitter, and a comparison of the results made which gives an index of the articulation qualities of the transmitter.

Receivers are tested in much the same manner as transmitters for volume and articulation.

### Line Testing.

Crosstalk tests are made by the use of calibrated shunts similar to those that are used in this country.

On transmission tests they have made use of two methods. One involves the direct comparison of the line under test with a standard line (artificial). They have also used direct testing methods by sending a given voltage and current into the line and measuring the output on the receiving end by means of calibrated measuring instruments. The losses in this case may, of course, be obtained by the ratio of the currents and voltages at the two ends of the line. The second method has not been found to be as practical as the comparison method.

## Cooperation Within Organization

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when the receiver is removed from the switch hook. If the resistance lowers, then the condenser is shorted.

Leaks to ground on equipment and on metallic circuits are determined by connecting one side of the ohmmeter to ground and the other to the circuit under test. The reading obtained is the resistance leak to ground.

Open or partially short-circuited repeating coils are easily detected.

High-resistance joints can be determined either by testing a span at a time or by means of long poles with suitable clips to connect the ohmmeter on each side of the joint.

For switchboard trouble the ohmmeter will be found very convenient. Cords can usually be tested (magneto boards only) by clipping across the tip and ring and shaking the cord. Partial opens are noted by fluctuating resistance values.

In working an open wire that is old and rusty, a convenient method of locating bad sections is to test it mile by mile. This is done by utilizing two men, one to go ahead and short-circuit the line and the other to stay behind and

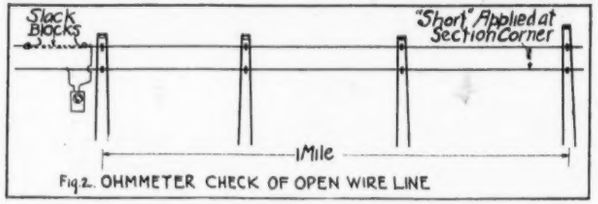

Fig 2. OHMMETER CHECK OF OPEN WIRE LINE

measure the resistance between section corners with the line shorted. It will be necessary for the man with the ohmmeter to open one side of the line, as shown in Fig. 2.

In addition to its many uses in the telephone testing, troublemen will find the ohmmeter almost invaluable in locating "bugs" in vacuum sweepers, electric irons, washing machines, radios, and all the other many devices that telephone maintenance men are often called on to repair for their subscribers.

The ohmmeter is also useful in checking the insulation resistance of open wire and cable. Leakage resistances as high as 1.5 megohms can be detected by connecting two 45-volt radio "B" batteries in series with the meter in place of the regular 3-volt battery.

The insulation resistance is found by the regular formula given in data sheet No. 2-A of Maintenance Practices.

In using the ohmmeter for this purpose, care must be exercised not to short-circuit the ends of the testing clips nor to connect them to circuits having resistances less than 50,000 ohms; otherwise the needle may be thrown violently off scale and the meter damaged.

## News Facts Education Assistance

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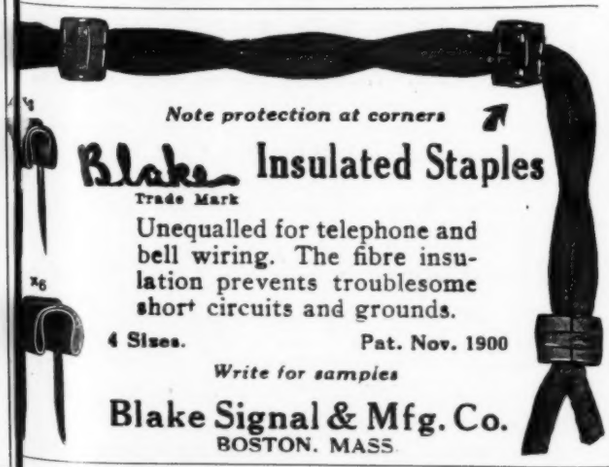

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# What the Commissions Are Doin

## Up-to-the-Minute News Regarding the Activities of State and Interstate Commissions, Courts and City Councils in Matters Concerning Telephone Companies—Summary of Commission Orders and Schedule of Telephone Hearings

### Company Authorized to Issue Securities for Plant Extensions.

The Home Telephone & Telegraph Co. of Fort Wayne, Ind., has been authorized by the Indiana Public Service Commission to issue and sell $500,000 securities.

This common stock issue will be used to reimburse the treasury for extensions already made by the company. Included in this program has been the installation of the new Eastbrook unit, pole lines and various underground systems.

### Indiana Bell Asks Authority to Issue $3,000,000 Notes.

Authority to issue $3,000,000 demand notes, bearing 6 per cent interest to be sold to the American Telephone & Telegraph Co., has been asked by the Indiana Bell Telephone Co. in a petition filed with the Indiana Public Service Commission.

The money will be issued to reimburse the Indiana Bell company's treasury for funds used in retiring other notes.

### Bell Authorized to Change Discount Dates in Nebraska.

The Northwestern Bell Telephone Co. has been authorized by the Nebraska State Railway Commission to modify its rate schedules in a number of exchanges and to change the dates on which the discount rule is effective at a majority of its exchanges in Nebraska, in order that it may substitute the rotation billing system. The changes in the rate schedules will affect 50 exchanges which it operates in that state and becomes effective October 15.

The company showing was that there is no demand for the service which it desires to cancel and that it is not being offered at the present time; that there is a demand for improved residence service at the exchanges where two-party service is to be offered; and that telephone service at all of the exchanges involved will be improved if the changes are approved. The changes include:

Residence two-party service at the net rate of $2 a month for local service and $2.25 per month for district service at the Butte, Spencer, Winside, Trenton, Stratton, Silver Creek and Mason City exchanges where one-party and four-party residence service are now effective.

Discontinuing the offering of grounded rural service at the Potter, Emerson, Laurel, Wayne, McCook, Boelus, Loomis, Holdrege and Atlanta exchanges, where metallic service only is being furnished.

Discontinuing the offering of grounded town service at Belgrade, Stuart, Rockville and Elwood exchanges and of grounded two-party residence service at Mason City exchange, metallic service being furnished for town service at these places.

Discontinuing the offering of business two-party service at the Atlanta, Brule, Elm Creek, Farnam, Loomis, Potter, Rockville, St. Libory, Elkhorn, Millard, Waterloo, Crawford, Harrison Allen, Cody, Creston, Crookston, Homer, Howells, Primrose, Waterbury and Elwood exchanges.

This class of service is not being furnished at these exchanges at the present time, it being in the interest of good service to offer only one-party service to business subscribers there. An exception is made at Bennington, where one and two-party business service will be offered, four-party service now given being cancelled. Four-party residence service will be discontinued at Valentine, Wayne, Elm Creek, Crookston, Cody and Creston.

Under existing tariffs, the company requires that rentals be paid in advance, a clause setting out that a discount will be allowed from the monthly rates for exchange service, in which the subscri entire account, including any balance is paid before the 15th of the m in all exchanges other than at O where dates vary from the 10th to 18th in various parts. These bills been rendered the first of the month

The commission says that the rota billing system has been tried out by a n ber of utilities and has proved to be cessful and economical. In the case telephone companies it should work even more satisfactorily, since disputes confusion will be lessened by having statements cover all charges up to the of the bill.

Under the new plan, the company stitutes a period of approximately 15 from the date of the bill, the discount varying with the billing date at the ous exchanges involved. The commis finds the change will improve service out interfering with existing rates. order provides that clauses carrying a cent discount where paid within 15 shall be allowed from the specified at the various exchanges.

### Commission Establishes Stand Yearly Rate for Schools.

The Nebraska State Railway Com sion has given the Nebraska Central phone Co., of Gibbon, authority to c a standard rate for schools at the changes operated by the company at bon, Shelton, Ansley, Arcadia and Ber The net annual rate is to be the sam the net rate for ten months' service c ing the class of service being furnish

Manager McGregor says that by le the telephone in service the entire year charging the ten months' rate, the would be approximately the same as th the regular rate were collected for

(*Continued on page 47.*)

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## WHAT THE COURTS AND COMMISSIONS ARE DOING.

(*Continued from page* 44.)

usual nine-month term and a service connection charge collected for the installation of the telephone when school is resumed in the fall. The commission found the request to be reasonable, and authorized this rate to be added to the company's tariff.

Mr. McGregor thinks that it affords a happy solution of a problem that has been more or less puzzling, and does away with misunderstanding due to the collection of the installation charge each year in each room or office where the instrument is installed.

### Ohio Commission Asked to Give Rehearing on Cambridge Valuation

The Cambridge Home Telephone Co., Cambridge, Ohio, recently filed an application with the Ohio Public Utilities Commission for a rehearing on its valuation for rate-making purposes, and this was denied on August 27. The company is expected to appeal from the commission's order to the state supreme court.

The commission recently fixed the company's valuation at $407,001.72 as against the company's claim of $630,395.62. The company seeks increased rates in its Cambridge and Byesville exchange areas.

### Summary of Commission Rulings and Schedule of Hearings.

CALIFORNIA.

August 25: Agnes Richey Kattenhorn applied for authority to sell a telephone line operated between Merrill and Malin, Ore., together with a right granted by the commission to extend the line into the Tule Lake district in Siskiyou county and Modoc county, Calif., to Columbia Utilities Co.

FLORIDA.

August 15: The Peninsular Telephone Co. filed application for permission to install an automatic system in its Auburndale exchange.

ILLINOIS.

September 2: Hearing at Springfield before Commissioner Collins on proposed advance in rates by the Southwestern Bell Telephone Co. for service in New Athens, county of St. Clair, stated in rate schedule I. C. C. 1 first revised sheet 1 filed by the company.

September 2: Hearing at Springfield before Commissioner Gilbert on proposed advance in rates by the Illinois Southeastern Telephone Co. for toll service from Shelbyville to Findlay, Windsor, Strasburg, Stewardson, Sigel, Shumway, Cowden, Beecher City, Herrick, Moweaqua, Neoga and Trowbridge; from Tower Hill to Mode, Westervelt, Findlay, Windsor, Strasburg, Stewardson, Cowden and Herrick; Humbolt to Charleston and Charleston to rural subscribers, etc., stated in rate schedule I. C. C. No. 2 rendered by the company.

September 2: Hearing at Springfield before Commissioner Kuhn on proposed advance in rates by the Illinois Consolidated Telephone Co. for toll service in Hillsboro, Nokomis, Raymond, Butler, Witt, Irving, Harvel, Farmersville and Waggoner and connections, stated in rate schedule I. C. C. 2, filed by the company.

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Resolution of protest was filed by the city of Nokomis against advanced rates by Wm. A. Bote, city clerk. Protests were also filed by the Nokomis Merchants Assocation, South Audubon Anti-Thief Association No. 285, the Witt Commercial Association, and subscribers of Montgomery county.

INDIANA.

August 26: Petition filed by the Northern Indiana Telephone Co. for authority to make a connection for a toll circuit between its North Manchester exchange, and the Warsaw exchange of the Kosciusko County Telephone Corp. at the boundary between the exchange areas of the companies.

August 26: Petition for authority to issue $3,000,000 in demand notes filed by the Indiana Bell Telephone Co. The notes, which would bear 6 per cent interest, would be sold to the American Telephone & Telegraph Co. and funds derived would be used to reimburse the Indiana company's treasury for funds paid out in retiring other notes, according to the petition.

MISSOURI.

August 18: Complaint filed by R. F. Ferguson, et al., against the Missouri Standard Telephone Co.

August 19: Application filed by L. Q. Adamson for permission to sell the Purdy Telephone Co., of Purdy, to T. J. Preddy, and to issue notes secured by a mortgage upon the property.

August 20: Order issued approving application filed by the Middle States Utilities Co. of Missouri for permission to abandon its exchange at Goshen.

August 21: Complaint filed by Willard Weston against Jamestown Telephone Exchange, of Jamestown, relative to a request for telephone service.

September 5: Hearing at Excelsior Springs on complaint of the commission upon its own motion against the Kearney Telephone Co. and the Southwestern Bell Telephone Co. for failure upon the part of the Kearney Telephone Co. to furnish reasonable service to its subscribers at Mosby.

NEBRASKA.

August 29: In the matter of the application of the Northwestern Bell Telephone Co. for authority to establish rural metallic rates of $2.25 a month for rural residence and $2.75 a month for rural business service, to be offered for the future; it appearing that there is no opposition to the establishing of metallic service, but a great desire for it, and that the rates proposed are in line with those charged at other exchanges of the company for similar service, the commission finds that the application should be granted, subject to complaint.

NEW YORK.

September 3: Hearing in New York on motion of the commission with reference to the tolls charged by the New York Telephone Co. for intrastate service.

OHIO.

August 27: Application of the Cambridge Home Telephone Co., Cambridge, for a rehearing on the order denying it an increase in telephone rates denied by commission.

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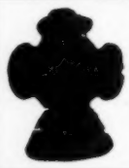
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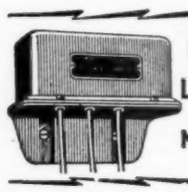
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## Pole-Hole Digging.

### General.

Holes for telephone poles may be dug by hand or by motor-driven digger. The initial cost of motor-driven diggers is fairly high; but if a large number of holes is to be dug, they will operate at a lower cost per hole than hand digging. Prices on truck-mounted diggers range from $3,000 to $9,000.

Hole digging by hand requires a certain amount of skill on the part of the digger to produce satisfactory holes in a reasonable time.

A motor-driven digger can dig the holes and set approximately 100 poles in an eight-hour day, where an experienced man can dig on the average only eight holes.

The labor unit for digging and setting 25 ft. 5 in. poles averages about $4.00 with large companies where holes are dug by hand.

### Tools Required.

The tools required for hole digging are:

1 8-ft. long handled shovel.
1 Digging spoon.
1 Digging bar.

### Methods.

Lines should be staked out prior to digging and holes dug around the stakes as a center. Methods of staking out a line are discussed under "Pole Line Design." Using the 8-ft. straight-handled shovel, dig a hole sufficiently large to permit tamping on all sides of the pole.

The best method of digging, Fig. 1, is to start a small pocket about six inches deep on the side of the hole away from the digger. The bottom of the hole is then cut up by forcefully jabbing the shovel into the earth so as to

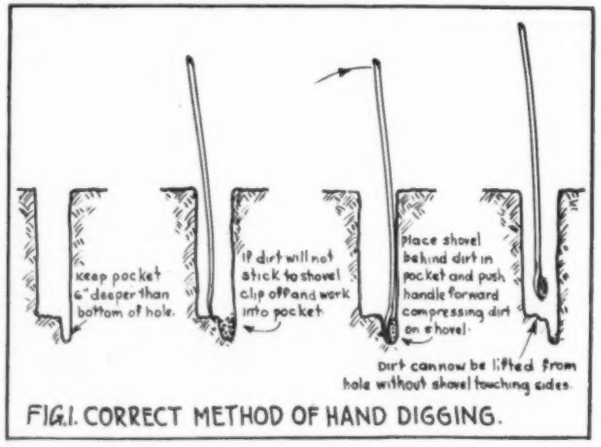
keep pocket 6" deeper than bottom of hole.
If dirt will not stick to shovel clip off and work into pocket
Place shovel behind dirt in pocket and push handle forward compressing dirt on shovel.
Dirt can now be lifted from hole without shovel touching sides.

FIG. 1. CORRECT METHOD OF HAND DIGGING.



loosen it. The loosened dirt is worked into the pocket and is easily removed by placing the shovel in the pocket and then compressing the dirt into a compact mass on the shovel by pushing the handle forward. The dirt can then be easily lifted from the hole. The depth of the pocket should be maintained always about six inches deeper than the bottom of the hole until the hole is down to the required depth.

On deep holes it will in some cases be necessary to remove the last six inches of dirt by means of a spoon. On exceptionally dry digging a spoon may also be required as it may be impossible to compress the dirt on a straight shovel by the "pocket method." In going through frost, the digging bar is used.

The sides of the hole should be kept straight and uniform. In exceptionally bad digging some relief may be had by pouring water in the hole.

Dynamite has been used in some cases for digging holes in particularly hard soil and rock. The danger attached to its use, both with respect to the men handling it and the public, precludes its very general use.

The method of dynamiting holes consists in boring a small hole with an earth auger to the depth of the required hole and slightly larger in diameter than a stick of dynamite. The bore hole is then charged with a fractional part of a stick of dynamite and set off by means of either a fuse or an electric current. The resulting explosion loosens the soil to such an extent as to make digging easy.

In rock blasting a somewhat similar procedure is followed although usually more bore holes and a higher grade or charge of explosive are required.

### Hole Depths.

The distance to which poles should be set in the ground depends upon the soil character, pole height and pole load. In general, poles should be set to the depths given in the following table. These depths are standard with many companies:

| Pole Length in Feet | Hole Depth (Dirt) in Feet |
|---|---|
| 16 | 3 |
| 20 (small poles) | 3 |
| 20 (large poles) | 4 |
| 25 (small poles) | 4 |
| 25 (large poles) | 5 |
| 30 | 5½ |
| 35 | 6 |
| 40 | 6 |

Small companies may find it desirable to set 25-foot poles at a depth of three feet where only a few wires are carried and where not exposed to the full force of storms.



## Loading Theory.

### General.

When the telephone art was a mere infant, it was noted that when long distance transmission was attempted, the voice currents were greatly attenuated (weakened) in passing over an open wire or cable line. It was apparent that this reduction in volume was not due to the ohmic resistance of the circuit alone, but rather to the combination of the ohmic resistance and capacity of the circuit.

The transmission efficiency of a telephone circuit is approximately equal to the product of the resistance times the capacity. If we increase either one, we lower the transmitting ability of the circuit that much.

We may reduce the ohmic resistance of a No. 12 iron wire circuit by substituting No. 12 copper, but obviously the capacity will not be materially reduced by this substitution. If we wish to still further increase the transmitting ability of the circuit, we must do something which will bring about a reduction in the capacity between wires.

Oliver Heaviside in 1885 suggested the placing of inductance coils at regular intervals along a telephone circuit, the thought being that the inductance would counteract or neutralize the injurious effect of the capacity of the voice current. Heaviside failed, however, to specify what the spacing between successive coils should be, and consequently little use was made at that time of his discovery.

In 1900, Prof. M. I. Pupin originated mathematical formulas that enabled the determination of the spacing between successive inductance coils so as to obtain approximately the same efficiency as if the inductances were uniformly distributed. He pointed out that certain definite relations must exist between the wave length of the transmitted current and the number of coils placed in the line in order to obtain a maximum gain from the insertion of the inductance coils in the line.

The placing of lumped inductances into a telephone open wire or cable circuit is known as "loading." The points at which loading is placed are known as load points and the inductances themselves as load coils.

Present-day load coils are constructed by winding many turns of copper wire on a core of compressed powdered permalloy, Fig. 2. There are two general types of load coils used for the loading of voice frequency circuits. One is the side-circuit coil, and the other the phantom. Fig. 3 illustrates the way these coils are inserted in a phantom group.

The side-circuit coils are used for loading the side circuits, while the phantom coils are connected in the side circuits but only serve to improve the transmission on the phantom circuit.

The early cores were made of fine iron wire and later of compressed iron dust. Permalloy, which is a recent development, has done much to reduce the size of load coils. It is a nickel-iron alloy and has a permeability much greater

(Over)

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than that of the old soft or hard iron cores, especially for small magnetizing forces such as voice currents. The energy losses are also somewhat smaller with permalloy.

The load coil cases are of various sizes, ranging from a small case for a few coils to the larger cases which will contain 200 coils.

Loading is used chiefly in connection with cables, the spacing between load coils ranging from 900 feet to 11,000

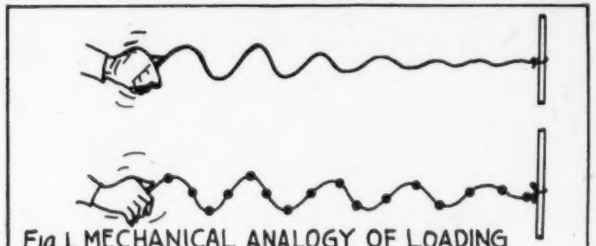

Fig. 1. MECHANICAL ANALOGY OF LOADING

Fig. 2. PERMALLOY LOAD COIL

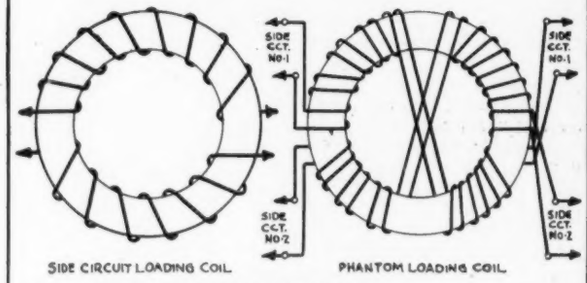


Fig. 3. SIDE AND PHANTOM COILS.

feet. The long distance cables that are being extended over the country by the Bell system companies employ loading usually at spacings of 6,000 feet, with repeater stations every 50 miles.

Loading is seldom required on subscribers' cables, except in the case of the largest cities and then only infrequently.